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Angler Effort and Catch in Five Fraser River Chinook Salmon Sport Fisheries, 1989

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ABSTRACT

Schubert, N.D. 1992. Angler effort and catch in five Fraser River chinook salmon sport fisheries, 1989. Can. Manuscr. Rep. Fish. Aquat. Sci. 2128: 69p.

The retention of chinook salmon (*Oncorhynchus tshawytscha*) adults in Fraser River system sport fisheries was eliminated in 1980 in response to escapement declines. Since 1986, improved escapements permitted the reopening of sport fisheries for chinook adults in a number of Fraser River locations. In 1989, chinook fisheries were opened in the Bowron, Clearwater, lower Fraser, Quesnel, lower Shuswap, South Thompson, Thompson and Vedder-Chilliwack rivers. The fisheries were regulated through harvest ceilings, time and area restrictions or daily and annual angler harvest limits. With the exception of the Bowron, Clearwater and Vedder-Chilliwack rivers, each fishery was evaluated using either a roving, access point or hybrid on-site survey.

A total of 4,044 anglers were interviewed in five study areas. An estimated 125,251 angler hours were expended to harvest an estimated 1,805 chinook adults, 159 chinook jacks, 8 sockeye salmon, 125 rainbow trout and 8 whitefish. Estimated releases totalled 159 chinook adults, 57 chinook jacks, 3 sockeye salmon and 3 rainbow trout. One hundred and one of the chinook adults were marked with adipose fin clips.

In an evaluation of angler response accuracy, the study concluded that anglers could accurately recall trip length but, when contacted during the trip, overestimated subsequent trip length by an average of one to three hours. The study also identified and discussed general biases associated with creel surveys.

Key words: upper Fraser River, sport fisheries, chinook salmon, angler effort, harvest, release, bias.

RÉSUMÉ

Schubert, N.D. 1992. Angler effort and catch in five Fraser River chinook salmon sport fisheries, 1989. Can. Manuscr. Rep. Fish. Aquat. Sci. 2128: 69p.

On a interrompu la pêche sportive des saumons quinnats (*Oncorhynchus tshawytscha*) adultes dans le bassin du fleuve Fraser en 1980 en raison du déclin de l'échappée. Depuis 1986, l'augmentation de l'échappée a permis la réouverture de la pêche sportive des quinnats adultes dans plusieurs régions de ce bassin. En 1989, on ouvrait la pêche dans les rivières Bowron, Clearwater, Quesnel, South Thompson, Thompson, Vedder-Chilliwack et dans les cours inférieurs du Fraser et de la Shuswap. La pêche sportive y a été contrôlée par l'imposition de plafonds de prises, de restrictions temporelles et spatiales ou de limites quotidiennes et annuelles de prises. Sauf dans les rivières Bowron, Clearwater et Vedder-Chilliwack, chaque pêche a été évaluée au moyen d'une enquête menée de point d'accès à point d'accès ou hybride, sur le terrain.

En tout, 4 044 pêcheurs sportifs ont été interrogés dans cinq secteurs d'étude. Selon les estimations, 125 251 heures-pêcheurs ont donné lieu à une récolte de 1 805 quinnats adultes, 159 jeunes quinnats mâles, 8 saumons rouges, 125 truites arc-en-ciel et 8 corégones. On estime que 159 quinnats adultes, 57 jeunes quinnats mâles, 3 saumons rouges et 3 truites arc-en-ciel ont été relâchés. On a marqué 101 des quinnats adultes en coupant leur nageoire adipeuse.

L'évaluation de la précision des réponses des pêcheurs a montré que les pêcheurs dont le séjour de pêche est terminé ont un souvenir précis de sa durée, mais que ceux qui ont été interrogés durant leur séjour ont surévalué d'une à trois heures, en moyenne, le temps qu'ils pensaient encore passer à pêcher. Par ailleurs, la présente étude traite des biais généraux qui se manifestent dans les enquêtes par interrogation des pêcheurs.

Mots-clés: partie supérieure du Fraser, pêches sportives, saumon quinnat, effort de pêche sportive, remise à l'eau, distorsion.

INTRODUCTION

The escapement of chinook salmon (*Oncorhynchus tshawytscha*) to the Fraser River system improved since the early 1980's to an extent which permitted the reopening of sport fisheries in selected terminal areas (Schubert 1988, 1989, 1990). In 1989, sport fisheries were opened in the lower Fraser, Bowron, Clearwater, Quesnel, lower Shuswap, South Thompson, Thompson and Vedder-Chilliwack rivers (Fig. 1). In most areas, structured assessment studies monitored fishery performance, evaluated stock impacts and provided data upon which future management decisions could be made.

This report describes the study design and field procedures and documents the results of the 1989 sport fishery assessment studies in the lower Fraser, upper Quesnel, lower Shuswap, South Thompson and Thompson rivers. The report presents estimates of angler effort, harvest and release by species, and angler attributes in each fishery, and concludes with a discussion of results and recommendations for the management and assessment of future fisheries.

STUDY AREA DESCRIPTION

FRASER RIVER

Sport fishing in the Fraser River occurs primarily from gravel bars in the lower 120 km below Agassiz (Fig. 2). In 1989, the retention of chinook adults was permitted throughout this area; however, the current study focused on a 28 km section between the Sumas River mouth and the Agassiz-Rosedale Bridge in June and July. Previous studies (DFO unpublished) had identified this as the major chinook interception area. Chinook adults from most Fraser River stocks were available to this fishery.

QUESNEL RIVER

The Quesnel River originates in the Cariboo Mountains and flows in a northwesterly direction, entering the Fraser River at Quesnel (Fig. 3). Chinook sport fishing was permitted between the mouth and Beaver Creek (57 km) and between Morehead Creek and the outlet of Quesnel Lake (25 km). Only the latter area was assessed in 1989.

SHUSWAP RIVER

The Shuswap River originates in the Monashee Mountains of south-central British Columbia and flows in a northwesterly direction, entering Mara Lake east of Salmon Arm. Chinook sport fishing was permitted between Mara and Mabel lakes (Fig. 4). The open area was accessible by road and boat. Lower Shuswap River chinook salmon were the only stock available to the fishery.

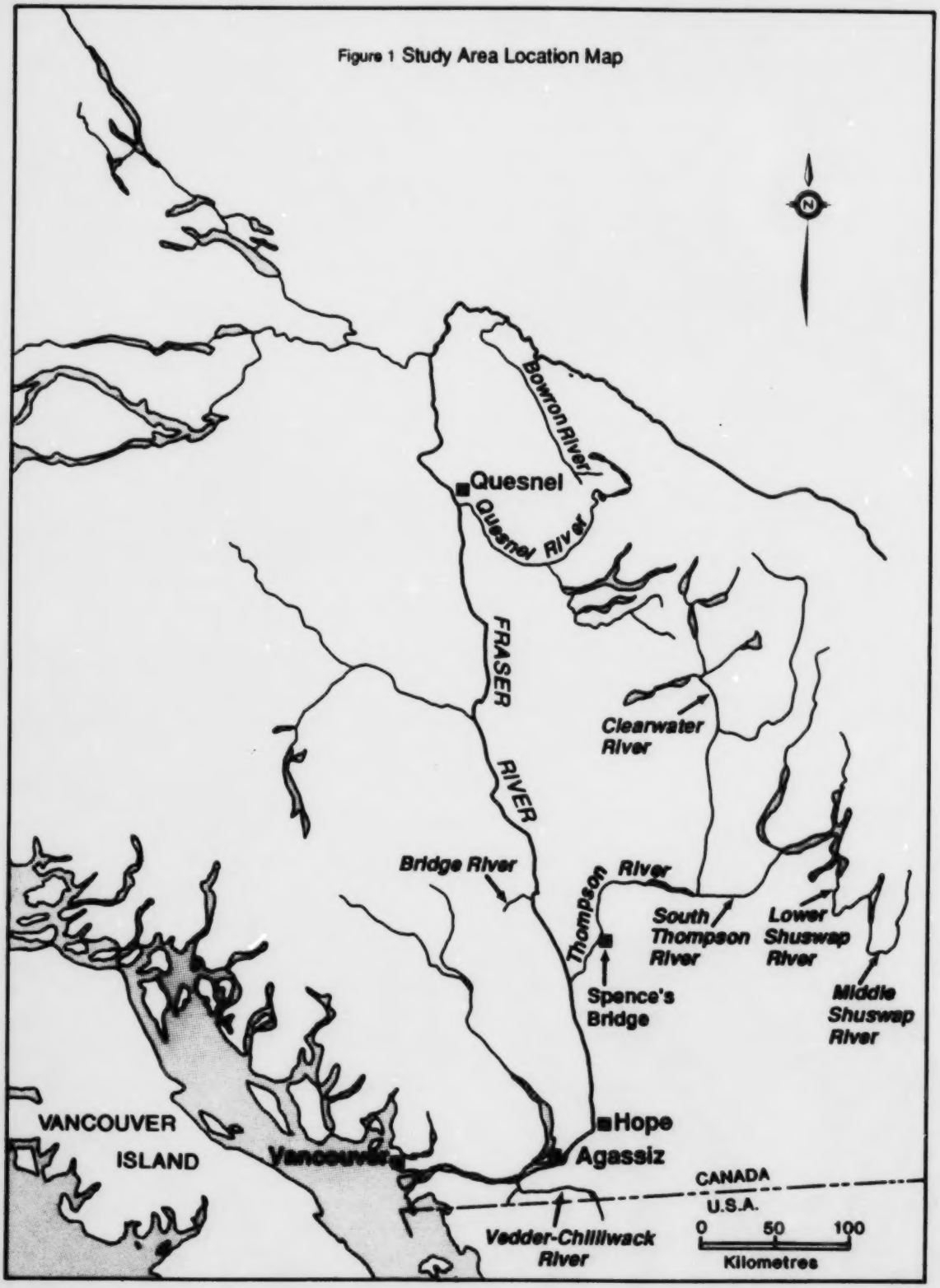
SOUTH THOMPSON RIVER

The South Thompson River originates at Little Shuswap Lake in south-central British Columbia and flows in a westerly direction for 65 km, entering the Thompson River at Kamloops (Fig. 1). Chinook sport fishing was permitted between the Pritchard and Chase bridges (Fig. 5). The open area was accessible by road and boat. The fishery was open during the peak migration of South Thompson River chinook; however, other South Thompson system chinook stocks may also have been available to the sport fishery.

THOMPSON RIVER

The Thompson River arises at Kamloops Lake and flows in a southwesterly direction for 109 km, entering the Fraser River at Lytton (Fig. 1). Chinook sport fishing was permitted in 1 km section between the Highway 8 Bridge at Spences Bridge

Figure 1 Study Area Location Map



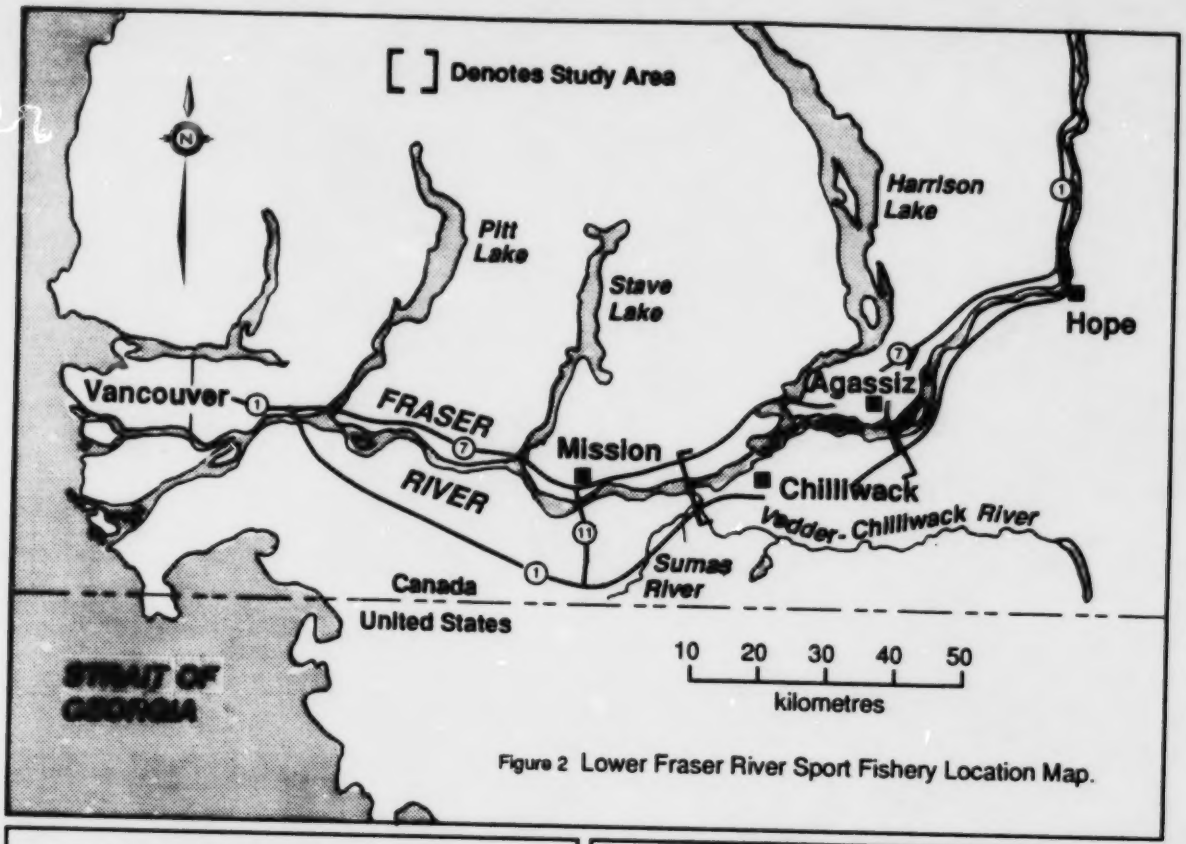


Figure 2 Lower Fraser River Sport Fishery Location Map.

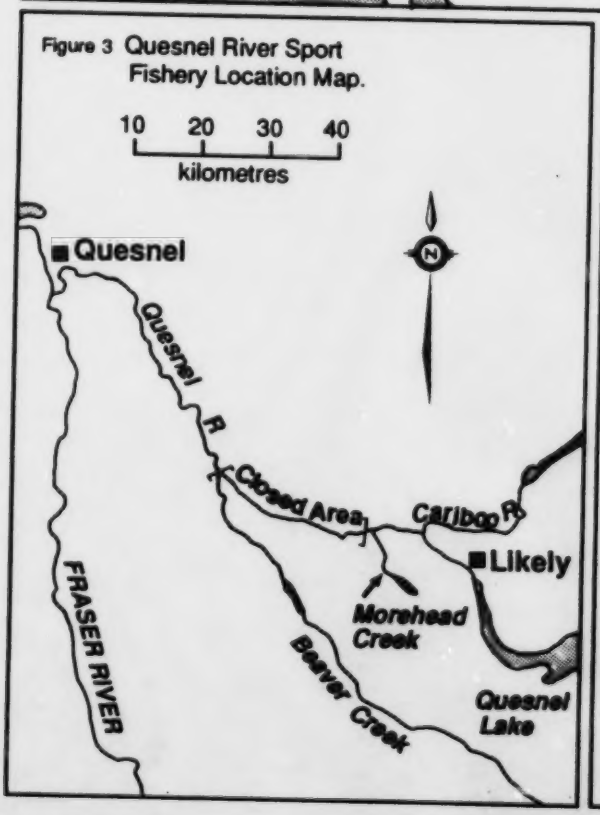


Figure 3 Quesnel River Sport Fishery Location Map.

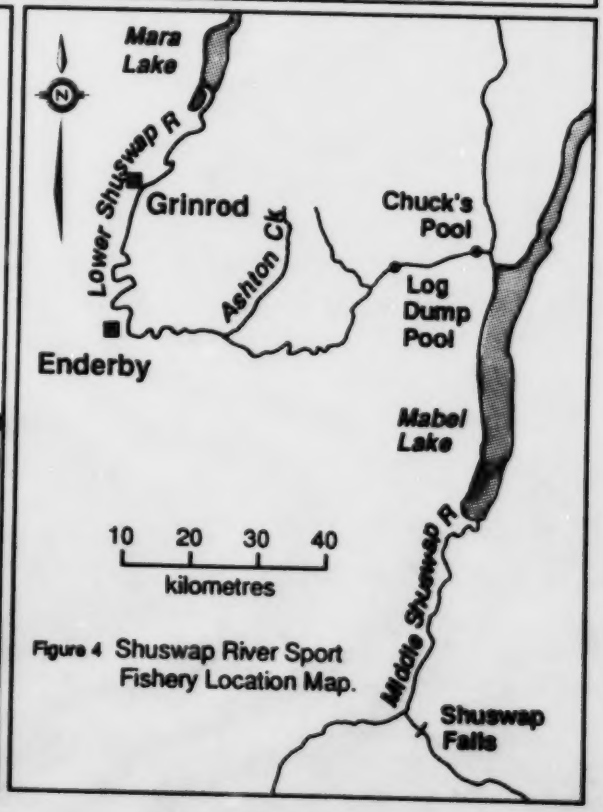


Figure 4 Shuswap River Sport Fishery Location Map.

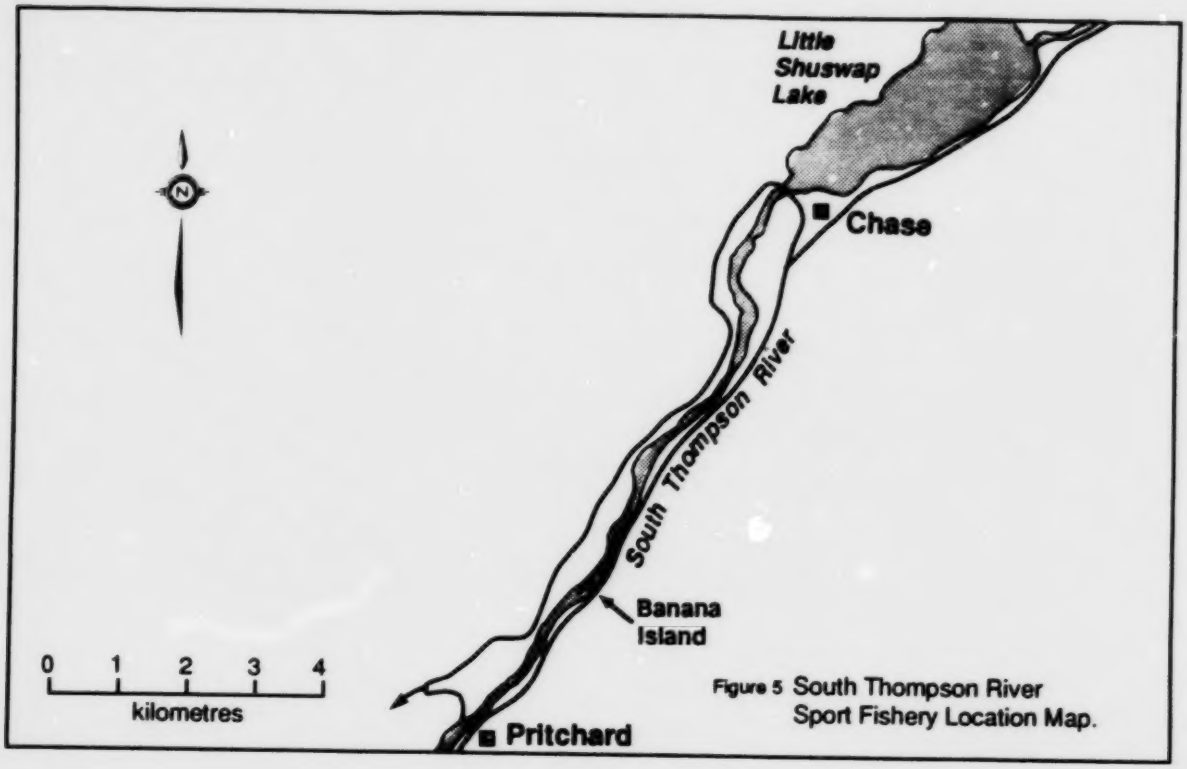


Figure 5 South Thompson River Sport Fishery Location Map.

Table 1. Sport fishery regulations in the 1989 Fraser River study areas.

Location	Open Period	Angler catch limits		Days open per week	Total days open	Harvest ceiling
		Daily	Annual			
Fraser River	Jun 1 to Sep 22	1	10	7	114 [a]	n/a
Quesnel River	Aug 4 to Sep 10	2	10	2	12	200
Shuswap River	Aug 16 to Sep 6	2	10	7	22	500
South Thompson	Aug 30 to Sep 13	2	10	7	15	200
Thompson River [b]	Jul 8 to Aug 27	1	10	2 [c]	12	100

a. Assessed in June and July (61 days) only.
b. Martel fishery closed on July 30.
c. Reduced to 1 day per week after July 30; daily fishing time increased by 7 hours (from 6 a.m. - 2 p.m. to 6 a.m. - 9 p.m.).

and the upstream bank of the Nicola River, and in a 0.6 km section downstream from Martel. The open area was accessible by road on both sides of the river.

FISHERY REGULATIONS

In general, the 1989 sport fisheries were managed through restrictions in fishing time, daily and annual angler harvest limits and fishery-specific harvest ceilings (Table 1). The main changes from 1988 (Schubert 1990) were: the lower Fraser River opened in June, the first time since 1979, and closed in late September to avoid harvest of Harrison River chinook; the lower Shuswap River opened one week earlier, an increase from 15 to 22 days; the South Thompson River opened earlier, an increase from 10 to 15 days; and the Thompson River fishery increased from 6 to 12 days and included a new area near Martel. Because the Thompson River harvest ceiling was reduced from 150 to 100 chinook adults, the fishing day was reduced by four hours (from 8 a.m. - 8 p.m. to 6 a.m. - 2 p.m.) and the northwest side of the river near Spences Bridge was closed.

METHODS

STUDY DESIGN

Fraser River

The lower Fraser River sport fishery between the Sumas River mouth and the Agassiz-Rosedale Bridge was assessed, using an access point-overflight design (DPA Group MS 1985a), between June 3 and July 27, 1989. A single surveyor worked one of two eight-hour shifts (7 a.m. to 3 p.m.; noon to 8 p.m.) which encompassed most daylight hours. The study period was stratified into weekday and weekend or holiday day types, with weekly assessment of three of the former and all of the latter. In total, 39 of the 61 open days were assessed.

The surveyor was stationed at a landing ramp on the south shore of the Fraser River immediately across from Queen's Island, the area of maximum expected study area angler effort. Upon arrival on the morning shift, the surveyor crossed the river by boat to inquire if any anglers had left before 7 a.m. and to request that anglers report for an interview at the end of their fishing trip. The surveyor then remained at the ramp to conduct hourly angler counts (using binoculars) and exit interviews. At the end of the shift, the surveyor again crossed the river by boat to interview any anglers still fishing. Each interview recorded angler trip length (to time of interview and expected additional time, if any), target species, number and species harvested or released, identifying marks on harvested fish (fin or maxillary clip), gear type and, if the angler had fished the lower Fraser River within two weeks, trip duration and harvest on the most recent trip. When possible, harvest was inspected to confirm species and mark identification. An interview form was completed for each angler; however, if the angler was unresponsive or if response reliability was questionable, the form was voided.

In addition to the above, the surveyor evaluated the angler's ability to recall trip duration at the end of the trip, and to predict subsequent duration when contacted during the trip. For the former, the estimated and actual trip durations were compared for anglers who completed an entire trip during the survey shift. For the latter, anglers already fishing were asked to estimate how much longer they intended to fish. If the angler completed the trip during the survey shift, the estimated and actual

subsequent trip durations were compared. In all cases, the surveyor ensured the angler was unaware that question response was being evaluated.

Approximately eight times per month, all anglers in the study area were counted from a Cessna 172 aircraft. Independent counts by two observers were made at noon and generally required 40 minutes.

Quesnel River

The upper Quesnel River sport fishery was assessed, using a roving design, between August 5 and September 10, 1989. A single surveyor, working one of two nine-hour shifts (5 a.m. to 2 p.m.; 1 p.m. to 10 p.m.), surveyed all open days. The surveyor travelled a predetermined route by automobile, with a randomly selected start point and direction of travel. The surveyor's rate of travel through the fishery was standardized to ensure that a complete circuit encompassed seven hours. Anglers were approached on foot and interviewed as above. In addition to the interviews, the surveyor conducted two one-hour instantaneous rod counts of the entire study area at randomly selected times. No interviews were conducted during the rod count.

Shuswap River

The Shuswap River sport fishery was assessed, using a hybrid design (Schubert 1988), between August 16 and September 4, 1989. Five surveyors worked one of two eight-hour shifts (5 a.m. to 1 p.m.; 1 p.m. to 9 p.m.). The study period was stratified into weekday and weekend or holiday day types, with weekly assessment of three of the former and all of the latter. In total, 16 of the 22 open days were assessed.

Surveyors were stationed at Chuck's and Log Dump pools and Enderby and Grinrod bridges, the areas of maximum expected angler effort, while a roving surveyor assessed the remaining areas. Daily access point and roving survey procedures were identical to those described for the lower Fraser and Quesnel rivers, respectively, except instantaneous rod counts occurred during the two periods of expected daily effort maxima (6 a.m. to 7:30 a.m. on the morning shift; 6 p.m. to 7:30 p.m. on the afternoon shift) and the chinook harvest was sampled for size (nose-fork length and weight), flesh colour, sex, adipose fin status and scales.

South Thompson River

The South Thompson River sport fishery was assessed, using a hybrid design, between August 30 and September 11, 1989. Two surveyors worked one of two eight-hour shifts (6 a.m. to 2 p.m.; noon to 8 p.m.). The study period was stratified into weekday and weekend or holiday day types, with weekly assessment of three of the former and all of the latter. In total, 10 of the 15 open days were assessed.

One surveyor was stationed at Banana Island, the area of maximum expected angler effort, while a roving surveyor assessed the remaining areas by boat. Daily access point and roving survey procedures were similar to those described for the lower Fraser and Quesnel rivers, respectively, except the instantaneous rod count occurred daily at 1 p.m. and angler response accuracy was not evaluated.

Thompson River

The Thompson River sport fishery was assessed by complete census between July 8 and August 27, 1989. Surveyors worked a shift (initially 6 a.m. to 2 p.m., extended to 6 a.m. to

9 p.m. after July 30) encompassing the entire daily open period. Surveyors were stationed at the Nicola River mouth and immediately downstream from Martel. The former had several access points; however, because the entire open area was within sight of the surveyor, a secondary surveyor was able to contact other anglers before they left the river. Daily procedures were identical to those described for the lower Fraser River, except instantaneous rod counts were not required and the chinook harvest was sampled for size (nose-fork length and weight), flesh colour, sex, adipose fin status and scales.

DATA MANAGEMENT

Data storage and analysis were conducted on an IBM AT compatible microcomputer. A custom designed data entry program (DPA Group Inc. MS 1985b) was used to generate ASCII files. The access point and hybrid survey files were then imported into a custom designed analysis program (DPA Group Inc. MS 1986), while the roving survey files were imported into a spreadsheet program for analysis.

The data were verified in three steps. First, all field data sheets were examined to ensure compliance with study procedures. Second, the data entry program performed 31 automatic error checks, including duplication detection, code validity, and range and consistency verification. Third, the ASCII data files were imported to a spreadsheet program for final verification with the field data sheets.

DATA ANALYSIS

Fraser River

Angler Effort: Profiles of daily angler effort were generated from hourly rod counts at Queen's Island, with effort before 7 a.m. and after 8 p.m. reconstructed from interview data. Hourly effort was weighted to compensate for the sampling imbalance which resulted from overlapping survey shifts.

Mean sample day angler effort (hours) for each stratum was the ratio of the mean rod count from the overflights and the proportion of daily effort occurring during the rod count time block (noon to 12:40 p.m.). Total angler effort was the product of the mean daily angler effort and the number of days in the stratum. The mathematical relationships are reported below. Variance calculations are detailed in Appendix 20.

1) Estimated total rods fishing ($\hat{R}_{hj}$), by hour and day type (weekday or weekend):

$$\hat{R}_{hj} = \sum_i N_h / n_{hij} \sum_k r_{hijk}$$

2) Estimated proportion of daily angler effort occurring during the instantaneous rod count time block ($\bar{p}_{hj\bullet}$), by day type:

$$\bar{p}_{hj\bullet} = \frac{\hat{R}_{hj\bullet}}{\sum_j \hat{R}_{hj}}$$

3) Estimated mean rod count during the instantaneous rod count time block ($\bar{y}_{hj\bullet}$), by day type:

$$\bar{y}_{hj\bullet} = \sum_k \frac{y_{hj\bullet k}}{n_{hj\bullet}}$$

4) Estimated angler effort (E_h), by day type, in hours:

$$E_h = N_h \frac{\bar{y}_{hj\bullet}}{\bar{p}_{hj\bullet}}$$

5) Estimated study period angler effort (E), in hours:

$$E = \sum_h E_h$$

where:

N_h = total days of day type h (weekday or weekend) in the study period;

n_{hij} = number of interview sample days on day type h at site i (Queen's Island) during hour j;

r_{hijk} = rod count on day type h at site i at hour j on day k;

$\hat{R}_{hj^*}$ = estimated total effort (hours) on day type h during the instantaneous rod count time block (j*);

y_{hj^*k} = instantaneous rod count on day type h on day k;

n_{hj^*} = number of instantaneous rod counts on day type h.

Catch Per Unit Effort: CPUE was calculated by species and mark group using a total ratio estimator (Von Geldern, Jr. and Thomlinson 1973; Malvestuto 1983), i.e. the total estimated catch was divided by the total estimated effort (to time of interview). Estimates were derived from interview data weighted by the proportion of study period stints which were surveyed (the day was divided into three stints: 7 a.m. to noon; noon to 3 p.m.; and 3 p.m. to 8 p.m.) to account for sampling imbalances resulting from overlapping survey shifts and the proportion of anglers in each hour who left the site without an interview. CPUE was calculated separately for harvested (HPUE) and released (RPUE) fish; however, RPUE was not calculated by mark type because angler mark recognition was considered unreliable. The mathematical relationships are reported below.

6) Estimated study period catch to time of interview at the survey site ($\hat{X}_h$), by day type:

$$\hat{X}_h = \sum_I \sum_I \frac{1}{a_{hil}} \sum_f \sum_q \sum_u \frac{x_{hilfqu}}{a_{hilfq}}$$

7) Estimated study period angler hours to time of interview at the survey site ($\hat{T}_h$), by day type:

$$\hat{T}_h = \sum_I \sum_I \frac{1}{a_{hil}} \sum_f \sum_q \sum_u \frac{t_{hilfqu}}{a_{hilfq}}$$

8) Estimated catch per angler hour at the survey site ($\bar{c}_h$), by day type:

$$\bar{c}_h = \frac{\hat{X}_h}{\hat{T}_h}$$

where:

a_{hil} = proportion of total study period stints of type 1 for site i (Queen's Island) on day type h which were surveyed;

a_{hilfq} = proportion of anglers leaving in time block q on stint f of stint type 1 at site i on day type h who were interviewed;

x_{hilfqu} = catch to time of interview by angler u leaving in time block q on stint f of stint type 1 at site i on day type h;

t_{hilfqu} = hours fished to time of interview by angler u leaving in time block q on stint f of stint type 1 at site i on day type h.

Before calculating CPUE, the raw interview data were tested for significant differences in CPUE between all interviews and complete trip interviews. The test used, from Cochran (1977), was:

9) Estimated variance of the

difference between two ratios ($\mathrm{Var}(\bar{c}_c-\bar{c}_t)$):

$$Var(\bar{c}_c-\bar{c}_t) = Var(\bar{c}_c)+Var(\bar{c}_t)$$

where:

$\mathrm{Var}(\bar{c}_c)$ = variance of CPUE from complete trip interviews:

$$\frac{1}{n(n-1)\bar{t}^2}\left(\sum x_u^2-2\bar{c}_c\sum x_u t_u+\bar{c}_c^2\sum t_u^2\right)$$

$\mathrm{Var}(\bar{c}_t)$ = variance of CPUE from all interviews, calculated as above.

$\bar{t}$ = mean time to interview.

If $(\bar{c}_c-\bar{c}_t)\pm(\text{t-table, } 0.95)(\mathrm{Var}(\bar{c}_c-\bar{c}_t))$ did not include zero, the difference was significant. If a significant difference in CPUE was noted, incomplete trip interviews were excluded from analysis for that site.

Harvest and Release: Total harvest and release, estimated by species and mark group, was the sum of individual estimates for the weekday and weekend or holiday strata. For each stratum, harvest and release was the product of stratum effort and the corresponding value of HPUE or RPUE.

10) Total study period catch (C):

$$C = \sum_h \bar{c}_h E_h$$

Harvest Rate: In all study areas, the harvest rate of chinook adults was the ratio of the estimated harvest and the sum of the estimated harvest and the observed escapement (provided by field staff). Harvest rates were not calculated for other species because total abundance was unknown.

Angler Characteristics: In all study areas, the following unweighed angler attributes were summarized by site and day: mean angler day length by weather type (clear, overcast and rain), mean angler day length from complete and incomplete trip interviews, numbers of anglers fishing for each species and preferred gear type. Study period mean angler day length, calculated from complete trip interviews, was estimated from site-specific data weighted by estimated angler effort. Results of the angler response verification were summarized by study period.

Quesnel River

Angler Effort: A profile of hourly angler effort was generated from the twice daily study area rod counts. Mean daily angler effort was the sum of the mean rod count in each two-hour time block. Total angler effort was the product of the mean daily angler effort and the number of days in the study period. The mathematical relationships are described below; variance was calculated using standard procedures.

11) Estimated mean rod count during the two-hour time block j ($\bar{y}_j$):

$$\bar{y}_j = \frac{\sum_k 2\, r_{jk}}{n_j}$$

12) Estimated mean daily angler effort ($\bar{E}$), in hours:

$$\bar{E} = \sum_j \bar{y}_j$$

13) Estimated study period angler effort (E), in hours:

$$E = N\bar{E}$$

Catch per Unit Effort: CPUE was calculated by species and mark group for each stratum using a total ratio estimator. In general, CPUE was estimated as described for the

lower Fraser River, except observed catch and effort to time of interview were used, and the data were not weighted by the proportion of anglers leaving without being interviewed. CPUEs and their variances were calculated as follows:

14) Catch per unit effort ($\bar{c}$):

$$\bar{c} = \sum_I \frac{w_I (\sum_u x_u / \sum_u t_u)}{\sum_I w_I}$$

15) Variance of CPUE ($Var(\bar{c})$)

$$Var(\bar{c}) = (1/\bar{t}^2) \sqrt{\frac{\sum_u ((x_u - \bar{c})\, t_u)^2}{n(n-1)}}$$

where:

x_u = catch to time of interview of angler u;
t_u = hours fished to time of interview by angler u;
$\bar{t}$ = mean time spent angling to time of interview;
n = number of anglers interviewed in stratum;
w_I = proportion of stints of type 1 which were surveyed.

Harvest and Release: Total harvest and release, by species and mark group, was calculated as in Equation 10.

Shuswap River

Lower Shuswap River data were analyzed using the procedure described for the lower Fraser River. Angler effort was calculated from profiles observed at Chuck's and Log Dump pools and Enderby and Grinrod bridges, and from instantaneous counts from the above sites and the roving survey. CPUE was generated from information collected at all sites; however, CPUE was first tested for differences between sites in addition to between interview types (Equation 9). If a significant difference in CPUE was noted between sites, then equations 6, 7 and 8 were replaced with the following:

16) Estimated total catch to time of interview ($\hat{X}_{hi}$), by site and day type:

$$\hat{X}_{hi} = \sum_I \frac{1}{a_{hil}} \sum_I \sum_q \sum_u \frac{x_{hilfqu}}{a_{hilfq}}$$

17) Estimated total angler hours to time of interview ($\hat{T}_{hi}$), by site and day type:

$$\hat{T}_{hi} = \sum_I \frac{1}{a_{hil}} \sum_I \sum_q \sum_u \frac{t_{hilfqu}}{a_{hilfq}}$$

18) Estimated catch per angler hour ($\bar{c}_{hi}$), by site and day type:

$$\bar{c}_{hi} = \frac{\hat{X}_{hi}}{\hat{T}_{hi}}$$

19) Estimated mean catch per angler hour at all sites (weighted by site angler effort) ($\bar{c}_h$), by day type:

$$\bar{c}_h = \frac{\sum_I \bar{c}_{hi} E_{hi}}{\sum_I E_{hi}}$$

where:

E_{hi} = $N \frac{\bar{y}_{hij\bullet}}{\bar{P}_{hj\bullet}}$

= estimated total angler effort at site i on day type h;
$\bar{y}_{hij\bullet}$ = mean rod count at site i on day type h during the instantaneous rod count time block.

South Thompson River

South Thompson River data were analyzed using the procedures described for the lower Fraser and Shuswap rivers. Angler effort was calculated from the 1987 profile (Schubert 1989) and from instantaneous counts from the roving and Banana Island surveys. CPUE was generated from information collected at Banana Island and by the roving survey.

Thompson River

Because the Thompson River study was a complete census, angler effort, CPUE and catch were measured directly: angler effort was the sum of the hours fished by all anglers; catch was the sum of the observed catch to time of interview; and CPUE was the ratio of catch and angler effort. The mathematical relationships are reported below.

20) Total angler effort (E), in hours:

$$E = \sum_{i} \sum_{u} t_{iu}$$

21) Total study period catch (C):

$$C = \sum_{i} \sum_{u} x_{iu}$$

22) Total catch per angler hour ($\bar{c}$):

$$\bar{c} = \frac{C}{E}$$

RESULTS

Study results for the five Fraser River chinook sport fisheries are summarized in Tables 2, 3 and 4. Based on 4,044 interviews, an estimated 125,251 angler hours (24,949 angler days) were expended to harvest (release) 1,805 (159) chinook adults, 159 (57) chinook jacks, 8 (3) sockeye (*Oncorhynchus nerka*), 125 (3) rainbow trout (*Oncorhynchus mykiss*) and 8 whitefish (*Prosopium sp.*). Chinook adult harvest rates ranged from 1.08% to 2.52%.

The 1989 fisheries were successful in attracting anglers primarily interested in harvesting chinook salmon; the proportion of lower Fraser River anglers fishing for *anything* probably reflects interviewer error. The average angler fished for 2.0 to 7.0 hours per day using bait, lures or a combination of the two; few fished with flies. The average angler expended 11 to 162 hours to harvest one chinook adult. Results by study area are detailed below.

FRASER RIVER

Effort Distribution

One thousand, eight hundred and fifty-five anglers were interviewed at Queen's Island during the two month study period, 810 in June and 1,045 in July (Appendix 1). Weekday and weekend rod counts averaged 54 and 132, respectively, in June and 115 and 284, respectively, in July (Appendix 2). In June, 59% and 52% of the weekday and weekend anglers, respectively, were observed on Queen's Island, declining to 41% and 38%, respectively, in July.

Angler Effort

Daily Profile: Anglers fished from 1 a.m. to 10 p.m., with 80% of the effort occurring between 9 a.m. and 9 p.m. (Appendix 3; Fig. 6). Angler effort was relatively static between 10 a.m. and 6 p.m.

Total Angler Effort: Study period angler effort totalled 90,678

Table 2. Harvest, release and angler effort in the 1989 Fraser River study areas (95% confidence limits in parentheses).

	Lower Fraser River				Upper Quesnel River	Lower Shuswap River		South Thompson River	Thompson River	All areas
	June		July							
Number of interviews	810		1,045		126	1,136		581	346	4,044
Angler effort (hour)	26,212	(11,570)	64,466	(12,111)	1,832	19,449	(3,791)	12,118	1,174	125,251
Angler effort (day)	3,745		10,398		916	6,483		3,107	301	24,949
Harvest										
Chinook adult	599	(290)[a]	683	(169)[b]	40	(10)	120	(45)[c]	259 -	104 - [d]	1,805
Chinook jack	17	(33)	59	(27)	0	-	40	(31)	42 -	1 -	159
Sockeye	0	-	0	-	8	(3)	0	-	0 -	0 -	8
Rainbow	0	-	0	-	79	(13)	45	(45)	0 -	1 -	125
Whitefish	0	-	0	-	8	(3)	0	-	0 -	0 -	8
Release										
Chinook adult	73	(39)	43	(29)	0	-	0	-	3 -	40 -	159
Chinook jack	3	(4)	8	(10)	0	-	13	(14)	33 -	0 -	57
Sockeye	3	(4)	0	-	0	-	0	-	0 -	0 -	3
Rainbow	0	-	0	-	0	-	0	-	0 -	3 -	3

[a] Includes 42 with adipose fin clips.
[b] Includes 30 with adipose fin clips.
[c] Includes 10 with adipose fin clips
[d] Includes 19 with adipose fin clips

Table 3. Angler characteristics in the 1989 Fraser River study areas.[a]

	Lower Fraser River		Upper Quesnel River	Lower Shuswap River	South Thompson River	Thompson River
	June	July				
Mean angler day length (hour)	7.0	6.2	2.0	3.0	4.4	3.9
Target species (%)						
Chinook	0.0	0.0	57.1	97.4	99.0	94.5
Trout [b]	0.0	0.0	38.1	1.8	0.5	3.2
Anything	100.0	100.0	4.8	0.9	0.5	2.3
Gear (%)						
Bait	0.0	0.0	17.5	14.0	3.1	75.9
Lure	100.0	100.0	29.4	70.8	89.5	8.3
Bait/Lure	0.0	0.0	43.7	14.7	7.2	13.5
Fly	0.0	0.0	9.5	0.7	0.0	2.3

[a] Angler day length is weighted by site; all other data are unweighted.
[b] Includes rainbow, whitefish or Dolly Varden.

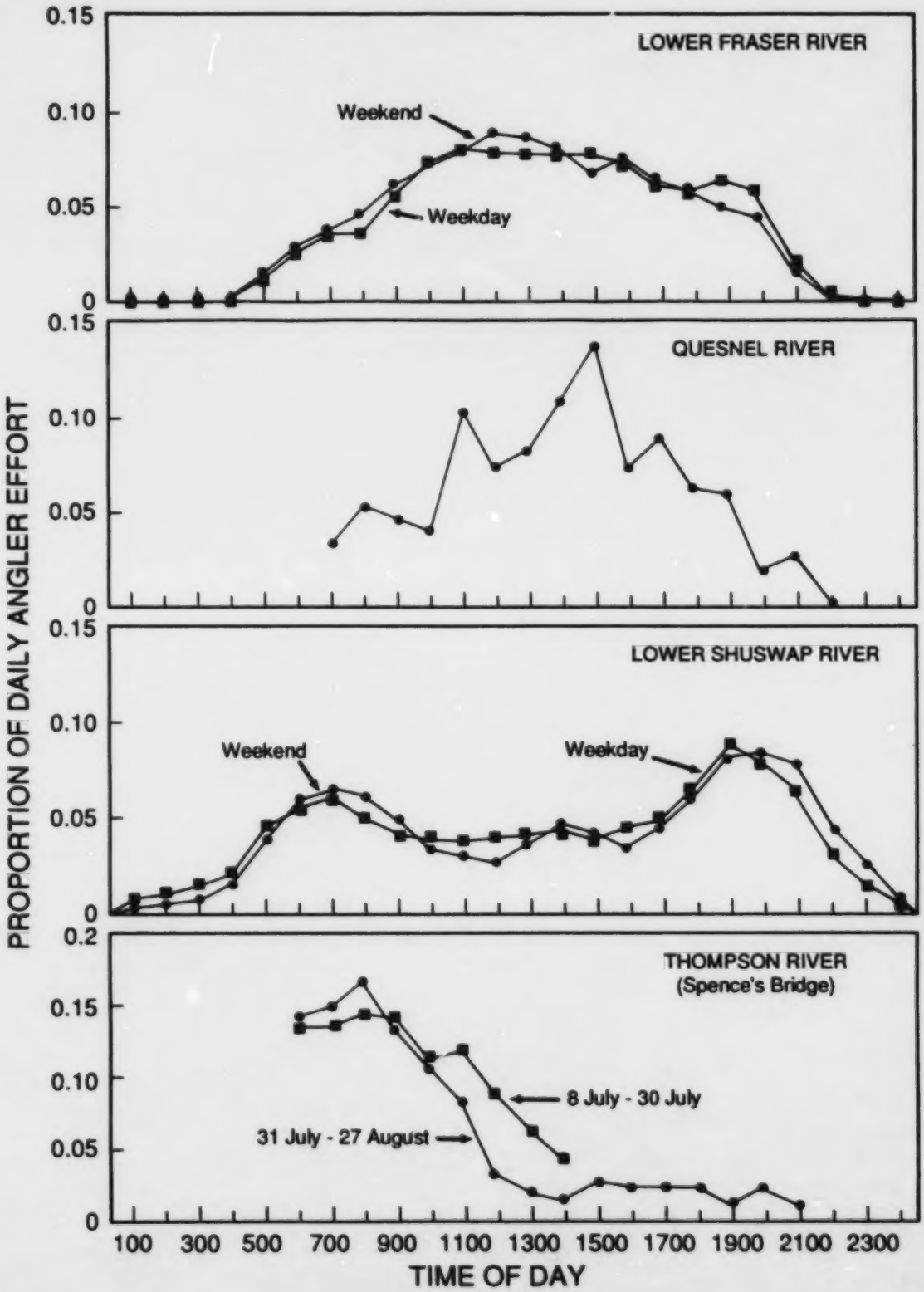


Figure 6 Hourly Angler Effort Profiles in the 1989 Study Area Sport Fisheries.

hours or 14,143 days (Table 2). Fifty-five percent of the angler effort occurred on weekend or holiday days, and 44% occurred on Queen's Island.

Catch Per Unit Effort

Harvest: Weighted chinook adult HPUE, expressed as fish per hour, was estimated at 0.0229 in June and 0.0106 in July (Appendix 4). HPUE was highest from late June through mid July. No significant difference ($p < 0.05$) was noted in HPUE estimated from complete trip and all interviews (Table 5), nor was a consistent difference noted between weekday and weekend HPUE.

Release: Weighted chinook adult RPUE was estimated at 0.0028 in June and 0.0007 in July (Appendix 4).

Harvest

Harvest was estimated at 1,282 chinook adults and 76 chinook jacks (Table 2). Forty-seven percent of the chinook adult harvest occurred in June, with the remainder in July. Seventy-two of the chinook adults had an adipose fin clip, with 11 (15.3%) coded wire tags recovered from mainly Thompson system stocks: Nicola (3), Coldwater (1), Deadman (1), Bonaparte (1), middle Shuswap (2), Salmon (1), Raft (1) and Chilliwack (1).

Release

An estimated 116 chinook adults, 11 chinook jacks and 3 sockeye were intentionally released in 1989 (Table 2).

Angler Characteristics

Angler day Length: Anglers fished and average 7.0 and 6.2 hours per trip in June and July, respectively (Table 3). Angler day length averaged 6.9, 6.9 and 7.3 hours on clear, overcast and rainy days, respectively.

Target Species: Anglers expressed no species preference in 1989 (Table 3); however, because chinook were the dominant harvestable species, it is likely that most were fishing for chinook.

Gear Type: All anglers used lures in 1989 (Table 3).

Previous Trip: In June and July, 54.6% and 75.0%, respectively, of the anglers interviewed had fished for chinook in the lower Fraser River within the last two weeks (Appendix 1). Unweighed chinook adult HPUE on the most recent trip was 0.0307 and 0.0173 in June and July, respectively (Table 5).

Angler Response Verification: Accuracy in recalling trip length was evaluated for 40 anglers (Appendix 5). Recall error ranged from under and over estimates of up to one and three hours, respectively; however, 93% of the anglers estimated trip length to within one hour, with a mean error of +0.2 hours.

Accuracy in projecting subsequent trip length when contacted during the trip was evaluated for 40 anglers (Appendix 5). Error ranged from under and over estimates of up to 2 and 12 hours, respectively. Only 30% of the anglers predicted subsequent trip length within one hour, and the distribution of responses was skewed with a mean error of +3.2 hours.

QUESNEL RIVER

Effort Distribution

One hundred and twenty-six anglers were interviewed during the 12 day study period (Appendix 6). Two instantaneous rod counts were conducted at random times each open

day (Appendix 7). Angling occurred primarily at road access points, with most anglers observed near the Quesnel Lake outlet (the Narrows) (29%) and downstream from Likely (66%). Few (5%) were observed between Likely and the Narrows.

Angler Effort

Daily Profile: Anglers fished from before 7 a.m. to 9 p.m., with 80% of the effort occurring from 10 a.m. to 7 p.m. (Appendix 3; Fig. 6). Effort peaked at 3 p.m.

Total Angler Effort: Study period angler effort totalled 1,832 hours or 916 days (Table 2).

Catch Per Unit Effort

Harvest: Chinook adult HPUE was estimated at 0.0218, with most of the harvest occurring on the last weekend (Appendix 8). No significant difference ($p < 0.05$) was noted in HPUE estimated from complete trip and all interviews (Table 5), probably reflecting the small sample size of the former.

Release: No fish of any species were released in 1989.

Harvest

Harvest was estimated at 40 chinook adults, 8 sockeye, 79 rainbow trout and 8 whitefish (Table 2).

Release

No fish were release in 1989.

Angler Characteristics

Angler Day Length: Anglers fished an average 2.0 hours per trip (Table 3). Angler day length averaged 1.7 and 2.0 hours on clear and overcast days, respectively. There were was no rain during the 1989 study period.

Target Species: Anglers attempted to harvest chinook (57%), trout (38%) or anything (5%) (Table 3).

Gear Type: Bait/Lure combinations were the most commonly used gear (44%), followed by lures (29%), bait (18%) and flies (10%) (Table 3).

Previous Trip: Twenty percent of the anglers interviewed had fished for chinook in the Quesnel River within the last two weeks (Appendix 6). Chinook adult HPUE on the most recent trip was 0.0265 (Table 5).

SHUSWAP RIVER

Effort Distribution

One thousand, one hundred and thirty-six anglers were interviewed during the 22 day study period (Table 2), 336 at Chuck's Pool, 183 at Log Dump Pool, 247 at Enderby Bridge, 97 at Grinrod Bridge and 273 in the remaining areas (Appendix 9).

Weekday rod counts averaged 55 and 73 in the morning and evening, respectively, while weekend rod counts averaged 66 and 83, respectively (Appendix 10). Angling occurred near road access points throughout the lower Shuswap River. On weekdays and weekends, respectively, 27% and 36% of the anglers were observed between Mable Lake and Skookumchuck, 23% and 20% between Fall and Cooke creeks and 15% and 12% between Grinrod and Enderby bridges. Few (less than 3%) were observed between Cooke Creek and Skookumchuck (Appendix 10).

Angler Effort

Daily Profile: Anglers fished the lower Shuswap River 24 hours per day (Appendix 3; Fig. 6). Effort was bimodal, with peaks at 7 a.m. and 7 p.m. on weekdays and 7 a.m. and 8 p.m. on weekends.

Total Angler Effort: Study period angler effort totalled 19,449 hours or 6,483 days (Table 2). Fifteen percent of the effort occurred at Chuck's Pool, 10% at Log Dump Pool, 15% at Enderby Bridge, 8% at Grinrod Bridge and 51% in the remaining areas.

Catch Per Unit Effort

Harvest: Weighted chinook adult HPUE was estimated at 0.0062. No significant difference ($p < 0.05$) was noted in HPUE estimated from complete trip and all interviews (Table 5); however, a significant difference ($p > 0.05$) was noted between sites. Chinook adult HPUE ranged from 0.0012 at Enderby Bridge to 0.0186 at Chuck's Pool (Appendix 11).

Release: Weighted chinook jack RPUE was estimated at 0.0007.

Harvest

Harvest was estimated at 120 chinook adults, 40 chinook jacks and 45 rainbow trout (Table 2). Ten of the chinook adults had an adipose fin clip, with coded wire tags recovered from 2 (20.0%) heads. Both were lower Shuswap River chinook.

Harvest Sampling: Sample results from the 1989 lower Shuswap River sport fishery are detailed in Appendix 12. The sample consisted entirely of red fleshed chinook, with males comprising 40% of the total. Overall size averaged 73.2 cm nose-fork length and 6.2 kg round weight. The harvest consisted of ages 5_1 (24%), 4_2 (12%), 4_1 (24%), 3_1 (18%) and 2_1 (24%).

Release

Release was estimated at 13 chinook jacks (Table 2).

Angler Characteristics

Angler Day Length: Anglers fished an average 3.0 hours per trip (Table 3). Angler day length averaged 3.5, 3.4 and 3.6 hours on clear, overcast and rainy days, respectively.

Target Species: Anglers attempted to harvest chinook (97%), trout (2%) or anything (1%) (Table 3).

Gear Type: Lures (71%) were the most commonly used gear, followed by bait/lure combinations (15%), bait (14%) and flies (1%) (Table 3).

Previous Trip: Fifty-six percent of the anglers interviewed had fished for chinook in the lower Shuswap River within the last two weeks (Appendix 9). Chinook adult HPUE on the most recent trip averaged 0.0082 (Table 5).

Angler Response Verification: Accuracy in recalling trip length was evaluated for 81 anglers (Appendix 5). Recall error ranged from under and over estimates of up to four and two hours, respectively; however, 83% of the anglers estimated trip length to within one hour of the correct time, and the mean error was 0.0 hours.

Accuracy in projecting subsequent trip length when contacted during the fishing trip was evaluated for 51 anglers (Appendix 5). Error ranged from under and over estimates of up to 1 and 15 hour, respectively. Although 73% of the anglers predicted trip length to within one hour of the actual time, the distribution of responses was skewed with a mean error of +0.8 hours.

SOUTH THOMPSON RIVER

Effort Distribution

Five hundred and eighty-one

anglers were interviewed during the 15 day study period (Table 2), 76 at Banana Island and 505 in the remaining areas (Appendix 13).

Weekday and weekend rod counts averaged 39 and 65, respectively (Appendix 14). Angling occurred throughout the study area, with a significant number of anglers accessing the fishery by boat. On weekdays and weekends, respectively, 47% and 37% of the anglers were observed in the area near Banana Island, 31% and 36% near Prichard, and 19% and 22% near Chase.

Angler Effort

Daily Profile: Because of surveyor unreliability, the hourly angler effort profile was not evaluated in 1989. The 1987 effort profile was used in the analysis (Schubert 1989).

Total Angler Effort: Study period angler effort totalled 12,118 hours or 3,107 days (Table 2).

Catch per Unit Effort

Harvest: Weighted chinook adult HPUE was estimated at 0.0214; HPUE was similar between sites (Appendix 15). No significant difference ($p < 0.05$) was noted in HPUE estimated from complete trip and all interview (Table 5)

Release: Weighted chinook adult RPUE was estimated at 0.0002.

Harvest

Harvest was estimated at 259 chinook adults and 42 chinook jacks (Table 2).

Release

Release was estimated at 3 chinook adults and 33 chinook jacks (Table 2).

Angler Characteristics

Angler Day Length: Anglers fished an average 4.4 hours per day (Table 3). Angler day length averagged 3.1, 4.2 and 3.0 hours on clear, overcast and rainy days, respectively.

Target Species: Anglers attempted to harvest chinook (99%), trout (less than 1%) or anything (less than 1%) (Table 3).

Gear Type: Lures were the most commonly used gear (90%), followed by bait/lure combinations (7%) and bait (3%) (Table 3).

Previous Trip: Previous trip information was not collected in 1989 due to surveyor error.

THOMPSON RIVER

Effort Distribution

Three hundred and forty-six anglers were interviewed during the 12 day study period (Table 2), 295 near the Nicola River mouth and 51 at Martel (Appendix 16). Effort was censused, with complete angler counts each hour.

Angler Effort

Daily Profile: The 1989 fishery was open from 6 a.m. to 2 p.m. during July 8-30 and from 6 a.m. to 9 p.m. during August 6-27. Angler effort peaked at 8 a.m. (Appendix 3; Fig. 6).

Total Angler Effort: Study period angler effort totalled 1,174 hours or 301 days (Table 2). Ninety-two percent of the effort (1,079 angler hours) occurred near the Nicola River mouth.

Catch Per Unit Effort

Harvest: Chinook adult HPUE

was 0.0964 at the Nicola river mouth and 0.0000 at Martel (Appendix 17).

Release: Chinook adult RPUE was 0.0371 at the Nicola River mouth and 0.0000 at Martel (Appendix 17).

Harvest

Harvest totalled 104 chinook adults (19 without an adipose fin), 1 chinook jack and 1 rainbow trout (Table 2). All of the chinook were harvested at the Nicola River mouth; 1 rainbow trout was harvested at Martel.

Harvest Sampling: Sample results from the 1989 Thompson river sport fishery are detailed in Appendix 18. The harvest, which consisted entirely of red fleshed chinook, consisted 62.5% of males and 37.5% females. Overall size averaged 74.4 cm nose-fork length and 4.6 kg. The harvest consisted of ages 5_2 (11%), 4_2 (83%), 4_1 (2%) and 3_1 (5%). All of the 19 chinook without adipose fins had CWTs; 18 were Spius Creek Hatchery releases of Nicola River chinook and 1 was a 1986 brood Deadman River chinook.

Release

Release totalled 40 chinook adults and 3 rainbow trout (Table 2).

Angler Characteristics

Angler Day Length: Anglers fished and average 3.9 hours per trip (Table 3). Angler day length averaged 3.9 and 4.3 hours on clear and overcast days, respectively. There were no rainy days during the 1989 study period.

Target Species: Anglers attempted to harvest chinook (95%), trout (3%) or anything (2%).

Gear Type: Bait was the most commonly used gear (76%), followed by bait/lure combinations (14%), lures (8%) and flies (2%) (Table 3).

Previous Trip: Previous trip information was not collected in 1989 due to surveyor error.

DISCUSSION

GENERAL

Fraser River

The lower Fraser River fishery was the largest of those surveyed, with over 70% of the angler effort and chinook adult harvest (Table 4). Fishery dynamics reflected chinook abundance, which peaked in late June (DFO unpublished), and Fraser River flows, which declined through the study period. Initial angler effort was low and occurred primarily on Queen's Island, one of the few high water angling sites. Subsequent effort increased with increasing chinook abundance and HPUE (Appendix 4) and dispersed to new sites as they emerged from the water; the proportion of total effort which occurred on Queen's Island declined from 60% in early June to 36% in late July (Appendix 2). After early July, declining chinook abundance had two effects: reduced total effort (Appendix 2) and a more pronounced effort dispersion due to reduced HPUE on Queen's Island (Appendix 4).

An assumption underlying the study methodology was that either the interview site was representative of the study area or the proportion of effort occurring at the site was sufficient to make the HPUE estimate insensitive to differences in other areas. In June, over 50% of the study area angler effort occurred at the survey site; therefore, the HPUE estimate was likely insensitive to differences in other areas. With effort dispersion in July, however, violation of the assumption of

Table 4. Harvest rate, catchability and harvest per unit effort (HPUE) in the 1989 Fraser River study areas. [a]

Fishery	Year	Angler effort (hr)	Chinook adult harvest	Chinook adult escapement	Catchability coefficient ($x10^{-6}$)	Harvest rate (%)	Mean HPUE
Lower Fraser River, June[b]	1989 [c]	26,212	599	-	-	-	0.0229
	1988	3,466	0	-	-	-	0.0000
	1987	4,892	0	-	-	-	0.0000
	1986	1,091	0	-	-	-	0.0000
Lower Fraser River, July[b]	1989	64,466	683	-	-	-	0.0106
	1988	57,772	1,400	-	-	-	0.0242
	1987 [c]	31,395	1,269	-	-	-	0.0404
	1986	8,550	0	-	-	-	0.0000
Quesnel River, upper	1989	1,832	40	3,400	6.35	1.16	0.0218
	1988	1,164	14	6,550	1.83	0.21	0.0120
	1986	1,484	14	9,250	1.02	0.15	0.0116
Shuswap River, lower	1989	19,449	120	11,000	0.55	1.08	0.0062
	1988	14,288	174	14,000	0.86	1.23	0.0122
	1987	6,071	215	10,000	3.47	2.10	0.0354
	1986	6,145	237	12,000	3.15	1.94	0.0386
South Thompson River	1989	12,118	259	10,000	2.08	2.52	0.0214
	1987	5,671	36	8,500	0.74	0.42	0.0063
Thompson River	1989	1,174	104	5,285[d]	16.76	1.97	0.0886
	1988	1,289	109	4,028[d]	20.44	2.63	0.0846

a. 1986-88 Quesnel, Shuswap, South Thompson and Thompson data from Schubert (1988, 1989, 1990).

b. 1986-88 effort and harvest estimated using 1989 procedures and unpublished data; catchability coefficient and harvest rate could not be calculated because stock-specific timing at the fishery site was not known.

c. First year of chinook adult retention since 1980.

d. Assumes fishery harvest was entirely from main Thompson River stocks, i.e. of Bonaparte, Deadman and Nicola chinook.

representativeness became more important. In July 1988, HPUE was estimated at three study area sites, Queen's Island, Wing Dam and Englebrich bars (DFO unpublished). Although between site differences were noted, only Wing Dam Bar was significantly different ($p < 0.05$). While study area HPUE was not homogeneous, effort at Wing Dam Bar was low in both years. The potential impact on study results, therefore, may have been minor.

The June chinook adult sport fishery in the lower Fraser River was reopened in 1989 for the first time since 1980. June angler effort increased over sevenfold relative to 1988 (Table 4), with mean angler counts increasing from 8 to 54 on weekdays and from 20 to 132 on weekends. In contrast, angler effort in the July fishery, where chinook retention has been permitted since 1987, remained relatively static over the same years but increased almost fourfold in 1987. Retention of chinook salmon, therefore, was a major determinate in the decision to participate in this fishery. Evaluations of future regulations should anticipate such responses.

Quesnel River

The 1989 upper Quesnel River sport fishery attracted minimal angler effort and harvested few chinook adults (Table 4). While chinook adult harvest, catchability, harvest rate and HPUE increased in 1989, the fishery remained a minor one. Further intensive monitoring is not warranted unless the fishery expands.

Evaluation of the upper Quesnel fishery was difficult due to the low effort and the short fishing period of 12 days. In 1989, only 126 angler interviews were collected, of which 27 were complete trip interviews. In testing for incomplete trip interview bias, sample size influenced the conclusion that no difference existed between the two interview types despite a large difference in HPUE (Table 5). Error in this conclusion would result in an underestimate of harvest.

Shuswap River

The lower Shuswap River fishery was one of the most intensive in the upper Fraser River system, with considerably greater angler effort than the Quesnel River, South Thompson River and Thompson River fisheries (Table 4). Effort increased by 36% over 1988 due to an increase in days open from 15 to 22; however, mean daily angler effort actually declined by 7%. Chinook adult catchability was similar to 1988 and below the 1986-87 level (Table 4). The 1988 decline was coincident with a change in fishing time from 2 to 7 days per week. It was hypothesized that, after exposure to angling, Shuswap River chinook exhibited a refractory period in which they were relatively unresponsive to angling. The expansion of the fishery from 2 to 7 days per week would have reduced catchability by eliminating the recovery period. If this was the case, catchability would be higher in the more remote, less crowded areas. In 1989, effort was more dispersed as anglers apparently searched for more effective fishing sites. For example, the proportion of annual angler effort at the two largest sites (Chuck's and Log Dump pools) declined from 68% in 1988 (Schubert 1990) to 25% in 1989. While angler behavior may be evolving in this fishery, the study was designed to contact all but a very small proportion of the anglers. These changes, therefore, were unlikely to have biased study results.

South Thompson River

The South Thompson River fishery expanded from 1987, the last year it was assessed (Table 4). Angler

effort doubled, chinook adult harvest increased eightfold and HPUE increased almost fourfold. These results, however, should be interpreted with caution. The 1989 study was unable to estimate the daily angler effort profile and, instead, used one generated in 1987. Error in the assumption that profiles were similar could generate considerable error in the estimate. For example, assessment data from the 1986-89 lower Shuswap River fishery (Schubert 1988, 1989, 1990) show up to a fourfold error in the effort estimate had the profile from a single year been used. While the South Thompson River estimates should be interpreted with caution, two factors suggest that harvest was considerably higher in 1989. First, daily rod counts recorded in the same time blocks were similar in 1987 and 1989. Because the fishery expanded from 5 days in 1987 to 15 days in 1989, total angler effort was almost certainly higher in 1989. Second, HPUE increased over threefold in 1989. While the the 1989 estimates of harvest and effort are not known with certainty, both effort and harvest increased substantially since 1987.

Thompson River

The Thompson River (Spences Bridge) fishery was an effective harvestor of chinook salmon, with one of the highest harvest rates and by far the highest HPUE and catchability coefficient in 1989 (Table 4). An average of only 11 hours was required to harvest one chinook adult.

In calculating the 1989 fishery harvest rate, two assumptions were made: first, that passing chinook from North and South Thompson River stocks were not vulnerable; and second, that Thompson River stocks (Bonaparte, Deadman and Nicola) were equally vulnerable. The 1988 study concluded that the first assumption was reasonable because: a) all CWTs recovered in the fishery were from main Thompson River stocks; b) fish size and age were consistent with main Thompson stocks; and c) timing in the lower Fraser River was consistent with a stock which would be differentially vulnerable while holding in the Thompson River near the tributary of origin (Schubert 1990). The second assumption, however, may be invalid. Harvest rate calculated from the Nicola River CWTs observed in the catch (18) and estimated in the escapement (778; C. Cross, pers. comm.) was 2.3%, higher than the 2.0% estimated in this study. Further, based on the estimated proportion of the Nicola River stock which returned with CWTs, an estimated 88% of the catch was of Nicola River origin, while Nicola River chinook comprised only 73% of the main Thompson River chinook escapement. It was concluded, therefore, that Nicola River chinook were differentially vulnerable to this fishery.

The 1989 sport fishery was further restricted from 1988 due to the decline of Nicola River chinook escapements. The 1989 regulations were relatively successful in constraining the fishery within the 100 harvest ceiling due primarily to the inseason catch monitoring program which provided a complete census of the fishery. The status of this stock, however, remains a concern. Although the 1989 escapement increased, it was below the brood year level and, without enhancement, the declining trend which began in 1986 would not have been halted. Given the effectiveness of this fishery, restrictive management should continue until the stock shows a clear rebuilding trend.

INCOMPLETE TRIP INTERVIEW BIAS

The 1987 upper Fraser River sport fishery study identified a negative bias in HPUE estimated from

Table 5. Estimated chinook adult harvest per unit effort (HPUE), by interview type, in the 1989 Fraser River study areas.

Location	Interview type [a]	Number of interviews	Angler hours	Chinook adult harvest	Chinook adult HPUE [b]
Lower Fraser River, June	Complete trip	339	2,382	56	0.0235
	Combined	810	5,690	128	0.0225
	Previous Trip	442	3,162	97	0.0307
Lower Fraser River, July	Complete trip	361	2,464	33	0.0134
	Combined	1,045	8,268	83	0.0100
	Previous trip	784	7,533	130	0.0173
Quesnel River, Upper	Complete trip	27	54	5	0.0926
	Combined	126	231	5	0.0216
	Previous trip	25	151	4	0.0265
Lower Shuswap River	Complete trip	428	1,418	18	0.0127
	Combined	1,136	3,271	32	0.0098
	Previous trip	641	3,761	31	0.0082
South Thompson River	Complete trip	76	253	7	0.0277
	Combined	581	1,769	32	0.0181
	Previous trip [c]	-	-	-	-
Thompson River	Complete trip	219	906	46	0.0508
	Combined	295	1,079	104	0.0964
	Previous trip [c]	-	-	-	-

[a] Combined indicates complete and incomplete trip interviews
[b] Not weighted by day type or site.
[c] Previous trip data unavailable.

incomplete trip interviews, i.e. interviews from anglers contacted during their trip (Schubert 1989). In 1988-89, this bias was addressed by increasing the maximum daily angler harvest limit from one to two chinook adults per day (Schubert 1990). In both years, no significant difference ($p > 0.05$) was noted in complete versus combined trip interview HPUE (Table 5), suggesting the change corrected this bias. Other indicators support this conclusion in certain 1989 study areas. HPUE was clearly independent of trip length (Fig. 7) in the Quesnel, lower Shuswap and South Thompson fisheries, and HPUE generated from angler estimates of harvest and angling time on their most recent trip were more similar to those generated from combined interviews in the Shuswap and Quesnel River fisheries (Table 5).

ANGLER RESPONSE VERIFICATION

The ability of anglers to recall trip length and to predict subsequent trip length was evaluated in the lower Fraser River and lower Shuswap River sport fisheries. The studies had similar results and will be pooled for the purpose of this discussion.

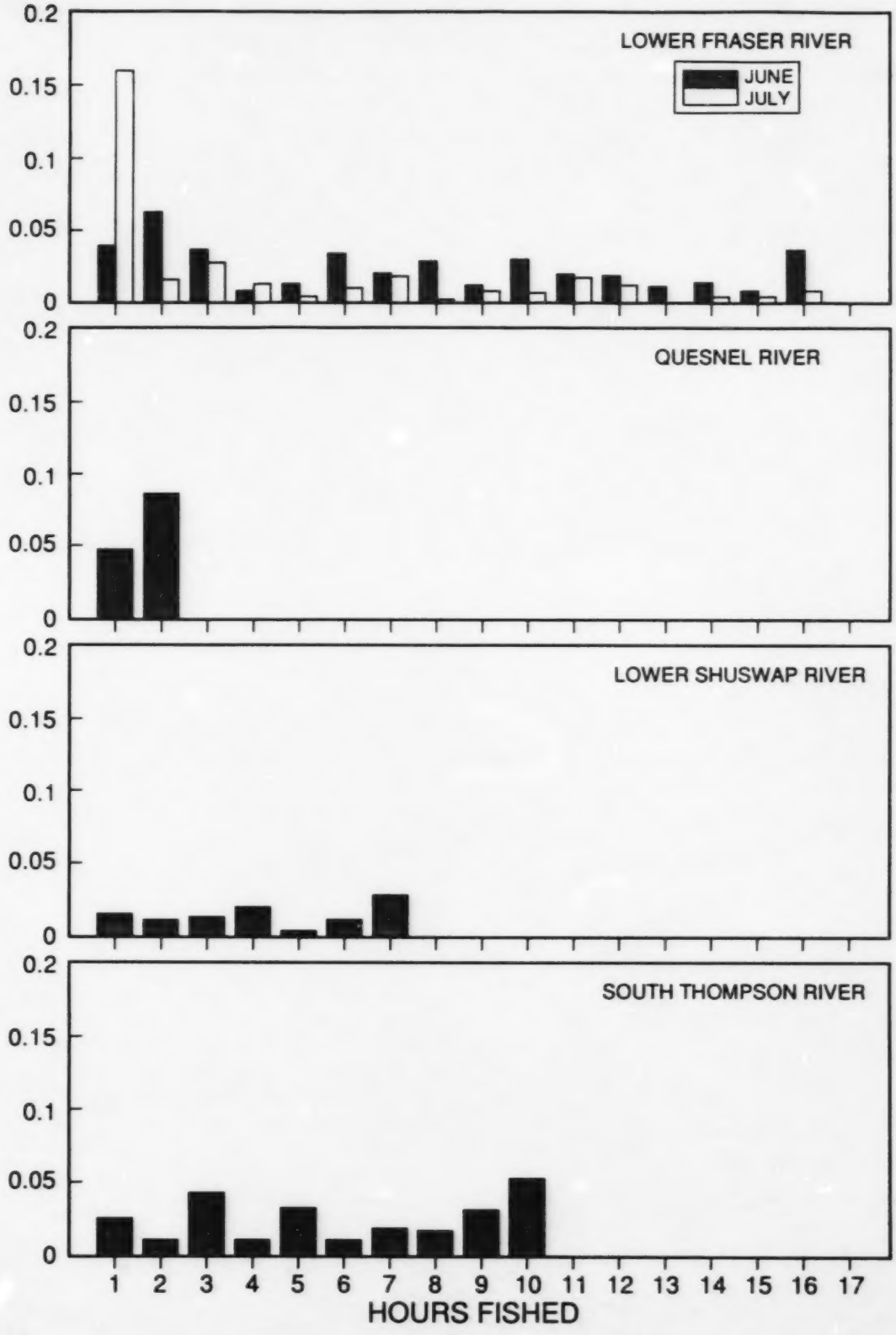


Figure 7 Harvest Per Unit Effort of Chinook Adults, by Angler Trip Duration, the 1989 Study Area Sport Fisheries.

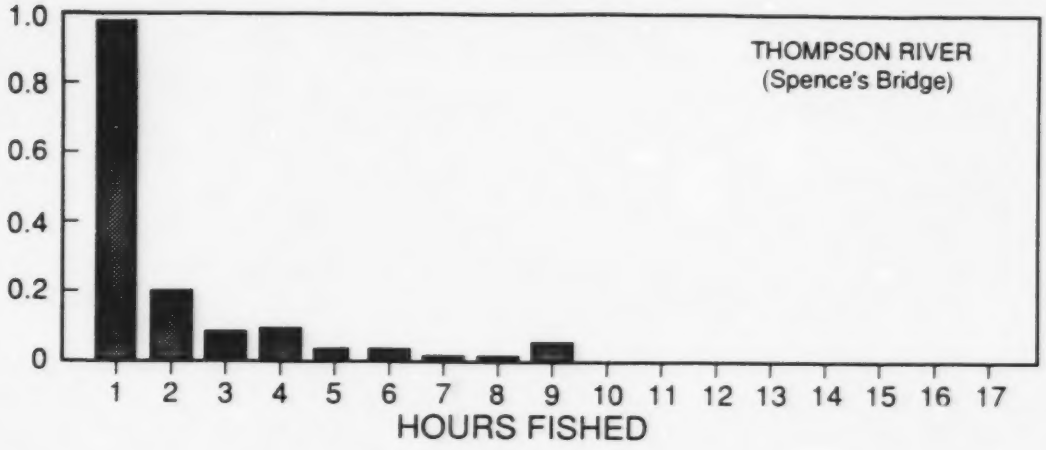


Figure 7 cont'd. Harvest Per Unit Effort of Chinook Adults, by Angler Trip Duration, in the 1989 Study Area Sport Fisheries.

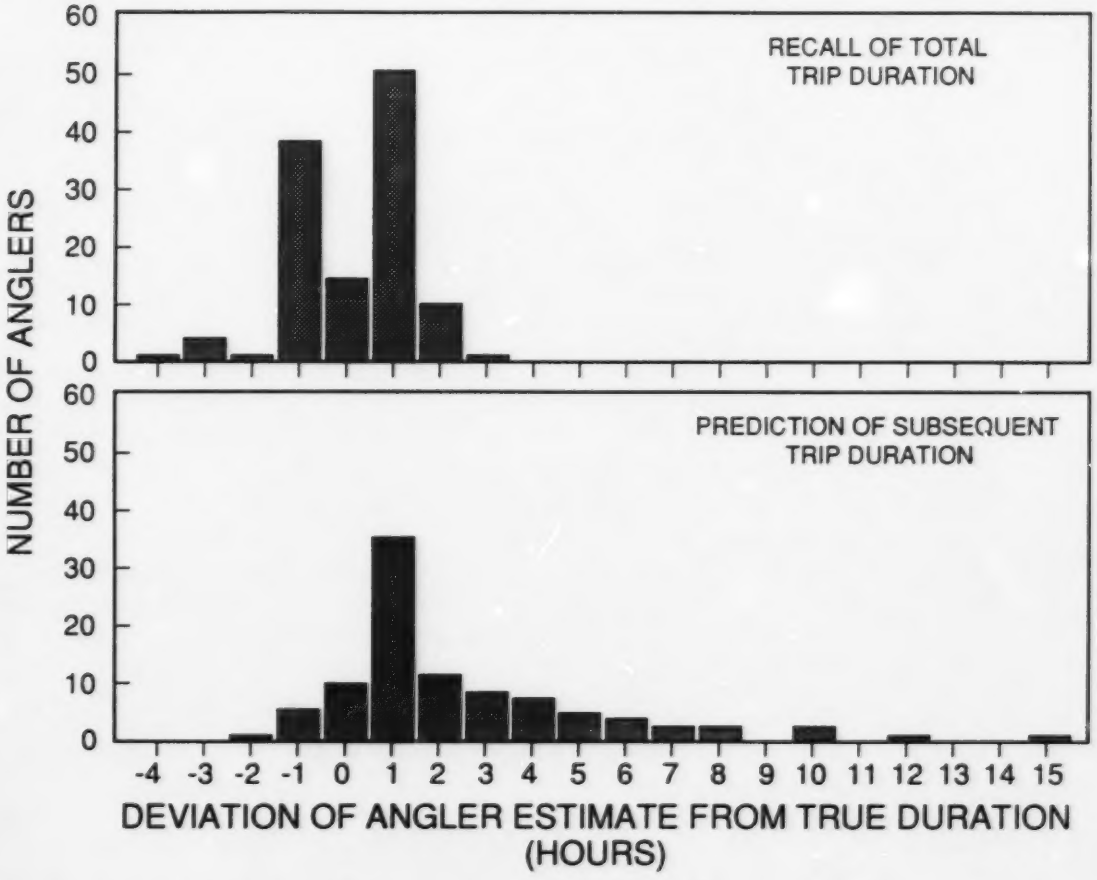


Figure 8 Angler Recall of Trip Duration at Trip's End and Prediction of Subsequent Trip Duration During the Trip.

Anglers were able to accurately recall trip length. For example, the average and maximum deviation between estimated and actual trip length was +0.1 and -4 hours, respectively, with 86% of the estimates within one hour of the true trip length (Fig. 8; Appendix 5). In contrast, anglers estimated subsequent trip length with both bias and error. The average and maximum deviation between the estimated and actual subsequent fishing time was +2 and +15 hours, respectively, with only 56% of the estimates within one hour of the true fishing time (Fig. 8; Appendix 5). Inaccuracy likely reflects a variety of factors, such as post-interview changes in weather, angling success, hunger, etc. which would affect an angler's decision to continue fishing. In contrast, the ability to recall trip length is constrained only by short term memory.

RECOMMENDATIONS

1. The 1989 sport fishery regulations were successful in constraining harvest to ceiling levels. Contingent upon stock strength, regulations could be further relaxed in the Quesnel and lower Shuswap fisheries. Changes cannot be recommended for the South Thompson River fishery until problems encountered in study implementation are corrected.

2. The Thompson River (Spences Bridge) sport fishery was an extremely effective harvester of chinook salmon. Because this fishery harvests primarily Nicola River chinook salmon, restrictive regulations should continue until the decline of Nicola River chinook escapements is halted and a rebuilding trend is established.

3. Structured fishery assessment studies should occur in the following areas: lower Fraser and lower Shuswap rivers, due to the high effort and chinook harvest levels; South Thompson River, to provide a proper evaluation of a fishery which has apparently expanded substantially since it was opened in 1986, and Thompson River, an effective fishery which targets on a stock of concern. Further evaluation is also required on the Clearwater River, which has not been monitored since 1986. Further monitoring is not required on the Quesnel River.

SUMMARY

1. Sport fishery assessment studies were conducted in the lower Fraser, upper Quesnel, lower Shuswap, South Thompson and Thompson (Spences Bridge) rivers in 1989. In general, each fishery was managed through restrictions in fishing time, daily and annual angler harvest limits and fishery-specific harvest ceilings. Each fishery was managed in a manner similar to the previous year, except the number of days open increased in the Shuswap (from 15 to 22 days), South Thompson (from 10 to 15 days) and Thompson (from 6 to 12 days) rivers. The lower Fraser River fishery opened on June 1, one month earlier than in 1988. The Thompson River harvest ceiling was reduced from 150 to 100 chinook adults.

2. The fisheries were assessed using a complete census (Thompson River), roving (upper Quesnel River), hybrid (lower Shuswap and South Thompson) or access point-overflight (lower Fraser River) survey.

3. Each fishery was assessed by one to five surveyors, depending on the extent of the open area, expected angler effort and available resources. The surveyors recorded the following information during 4,044 angler interviews: length of time angling, preferred species, number and species of fish harvested or released, identifying marks on harvested fish and gear type. In addition, if the angler had fished the river in the last two weeks, the interviewer recorded the number of previous trips in 1989 and, on the most recent trip, the harvest and length of time angling. In the lower Shuswap River and Thompson River fisheries, observed catch was sampled for size, flesh colour, sex, adipose fin status and scales. In the lower Fraser River and lower Shuswap River fisheries, the surveyor evaluated the angler's ability to recall trip duration at trip's end and to predict subsequent duration when contacted during the trip.

4. Study area angler effort was estimated at 125,251 angler hours or 24,949 angler days. Of that total, 90,678 occurred on lower Fraser River, 1,832 on upper Quesnel River, 19,449 on lower Shuswap River, 12,118 on South Thompson River, and 1,174 on Thompson River. Most anglers targeted on chinook salmon.

5. Study area harvest was estimated at 1,805 chinook adults, 159 chinook jacks, 8 sockeye salmon, 125 rainbow trout and 8 whitefish. Of the chinook adult harvest, 1,282 were from lower Fraser River, 40 from upper Quesnel River, 120 from lower Shuswap River, 259 from South Thompson River and 104 from Thompson River. A total of 101 chinook adults had adipose fin clips, 72 in lower Fraser River, 10 in lower Shuswap River and 19 in Thompson River.

6. Study area release was estimated at 159 chinook adults, 57 chinook jacks, 3 sockeye salmon and 3 rainbow trout. Chinook adults were released in lower Fraser (116), South Thompson (3) and Thompson (40) rivers.

7. Chinook adult harvest rates ranged from 1.1% to 2.5%. The highest harvest rates were recorded in the South Thompson and Thompson rivers.

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Appendices

Appendix 1a. Interview responses by day at Queen's Island Bar in the June 1989 lower Fraser River sport fishery.

	03-Jun	04-Jun	05-Jun	06-Jun	08-Jun	10-Jun	11-Jun	12-Jun	15-Jun	16-Jun
Number of Interviews	25	69	39	16	17	34	35	14	37	19
Weather a	-	C	C	C	C	C	C	-	O	-
Mean Angler Day Length (hr.)										
- All anglers	11.9	8.3	5.1	7.0	5.1	9.5	7.3	6.3	5.2	7.5
- Complete trip interviews										
Number	12	20	22	12	14	14	24	10	12	8
Hours	9.8	6.5	7.2	7.6	4.3	6.3	9.0	3.6	5.8	8.7
- Incomplete trip interviews										
Number	13	49	17	4	3	20	11	4	25	11
Hours	13.9	9.1	2.5	5.3	8.7	11.8	3.8	13.0	4.9	6.7
Mean number of anglers per party	2.6	3.6	2.7	2.4	2.1	4.1	4.3	2.4	2.2	2.3
Target Species										
- Anything	25	69	39	16	17	34	35	14	37	19
Harvested Catch										
- Chinook	3	9	1	1	-	-	-	-	3	7
- Chinook jack	-	-	-	-	-	-	-	-	-	-
Released Catch										
- Chinook	1	-	-	-	-	-	-	-	-	-
- Chinook jack	-	-	-	-	-	-	-	-	-	-
- Sockeye	-	-	-	-	-	-	-	-	-	-
Inspection of Catch										
- Number	1	8	1	1	0	0	0	0	2	7
- Number correct	1	8	1	1	-	-	-	-	2	7
Gear										
- Lure	25	69	39	16	17	34	35	14	37	19
1989 Previous Angling in the lower Fraser River										
- No. who fished chinook previously	6	12	20	9	5	22	11	7	2[illegible]	16
- Mean angler day length b	7.3	8.1	6.3	8.8	8.0	5.7	6.4	7.9	[illegible].4	7.4
- Harvest: b										
Chinook	2	6	5	2	-	4	2	-	1	3
Chinook jack	1	-	1	-	-	-	-	-	-	-
Cutthroat	1	-	-	-	-	-	-	-	-	-
Sturgeon	-	-	-	-	-	-	-	-	-	-

a. C - clear; O - overcast; R - rain.

b. On the most recent trip.

Continued

Appendix 1a. Interview responses by day at Queen's Island Bar in the June 1989 lower Fraser River sport fishery, continued.

	17-Jun	18-Jun	19-Jun	20-Jun	23-Jun	24-Jun	25-Jun	28-Jun	29-Jun	30-Jun	Total
Number of Interviews	47	26	9	13	67	59	84	55	74	71	810
Weather a	C	-	R	-	C	C	C	O	C	-	-
Mean Angler Day Length (hr.)											
- All anglers	8.4	5.6	9.7	6.5	8.7	11.9	8.1	8.5	8.3	10.2	8.3
- Complete trip interviews											
Number	20	16	0	7	25	19	55	19	11	19	339
Hours	5.9	6.7	-	5.6	8.4	7.5	7.6	7.3	6.4	5.3	7.0
- Incomplete trip interviews											
Number	27	10	9	6	42	40	29	36	63	52	471
Hours	10.3	3.9	9.7	7.4	8.8	14.0	9.0	9.2	8.6	11.9	9.3
Mean number of anglers per party	3.2	2.3	2.3	3.2	2.6	3.2	3.2	2.4	2.3	2.9	2.8
Target Species											
- Anything	47	26	9	13	67	59	84	55	74	71	810
Harvested Catch											
- Chinook	6	-	3	2	10	17	29	13	11	13	128
- Chinook jack	-	-	-	-	-	-	-	-	3	2	5
Released Catch											
- Chinook	-	-	-	-	2	5	3	-	2	2	15
- Chinook jack	-	-	-	-	-	-	-	-	-	1	1
- Sockeye	-	-	-	-	-	-	-	-	1	-	1
Inspection of Catch											
- Number	5	-	3	1	9	16	27	10	13	15	119
- Number correct	5	-	3	1	9	16	27	10	13	15	119
Gear											
- Lure	47	26	9	13	67	59	84	55	74	71	810
1989 Previous Angling in the lower Fraser River											
- No. who fished chinook previously	23	13	4	8	40	40	47	36	56	41	442
- Mean angler day length b	7.8	6.6	11.8	6.4	6.9	7.6	10.4	3.4	7.4	7.1	7.2
- Harvest: b											
Chinook	3	1	2	1	10	5	14	5	23	8	97
Chinook jack	-	-	-	-	-	-	-	-	1	2	5
Cutthroat	-	-	-	-	-	-	-	-	-	-	1
Sturgeon	1	-	-	-	-	-	-	-	-	-	1

a. C - clear; O - overcast; R - rain.
b. On the most recent trip.

Appendix 1b. Interview responses by day at Queen's Island Bar in the July 1989 lower Fraser River sport fishery.

	01-Jul	02-Jul	03-Jul	06-Jul	07-Jul	08-Jul	09-Jul	10-Jul	11-Jul	14-Jul
Number of Interviews	98	89	93	55	73	72	85	49	69	30
Weather a	R	C	R	C	C	O	-	-	C	O
Mean Angler Day Length (hr.)										
- All anglers	13.0	11.4	8.9	9.2	9.6	12.8	9.6	8.8	7.4	9.2
- Complete trip interviews										
Number	16	25	51	30	14	0	54	2	20	6
Hours	7.5	6.2	7.2	6.6	5.6	-	8.1	5.5	6.6	6.0
- Incomplete trip interviews										
Number	82	64	42	25	59	72	31	47	49	24
Hours	14.1	13.5	11.0	12.4	10.5	12.8	12.3	8.9	7.7	10.0
Mean number of anglers per party	3.8	5.4	3.2	3.3	2.7	4.1	3.2	2.7	2.6	2.2
Target Species										
- Anything	98	89	93	55	73	72	85	49	69	30
Harvested Catch										
- Chinook	11	8	6	5	5	2	15	3	2	5
- Chinook jack	1	-	-	-	1	-	2	-	1	-
Released Catch										
- Chinook	-	2	-	-	-	1	2	-	-	-
- Chinook jack	-	-	1	-	-	-	-	-	-	-
Inspection of Catch										
- Number	10	7	5	4	4	1	15	3	3	3
- Number correct	10	7	5	4	4	1	15	3	3	3
Gear										
- Lure	98	89	93	55	73	72	85	49	69	30
1989 Previous Angling in lower Fraser River										
- No. who fished CN previously	57	74	67	39	57	58	68	38	57	22
- Mean angler day length (hr) b	10.1	10.5	10.4	8.6	8.5	10.3	9.5	9.6	8.1	10.8
- Harvest: b										
Chinook adult	16	6	14	10	12	11	15	5	9	2
Chinook jack	-	-	-	-	-	-	-	2	-	-

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Continued

Appendix 1b. Interview responses by day at Queen's Island Bar in the July 1989 lower Fraser River sport fishery. continued.

	15-Jul	16-Jul	19-Jul	20-Jul	21-Jul	22-Jul	23-Jul	26-Jul	27-Jul	Total
Number of Interviews	61	57	26	14	12	57	32	37	36	1,045
Weather a	0	0	-	C	0	C	-	0	0	-
Mean Angler Day Length (hr.)										
- All anglers	8.6	9.0	8.9	8.1	8.8	10.5	9.5	7.2	8.2	9.8
- Complete trip interviews										
Number	29	33	5	3	8	21	13	22	9	361
Hours	6.9	6.8	4.6	6.3	7.1	5.6	4.4	8.5	4.5	6.2
- Incomplete trip interviews										
Number	32	24	21	11	4	36	19	15	27	684
Hours	10.2	12.1	10.0	8.6	12.3	13.3	13.0	5.3	9.4	11.4
Mean number of anglers per party	3.1	2.7	2.4	1.9	1.9	3.9	3.6	3.3	2.4	3.3
Target Species										
- Anything	61	57	26	14	12	57	32	37	36	1,045
Harvested Catch										
- Chinook	4	3	-	-	1	2	5	4	2	83
- Chinook jack	-	-	-	-	-	1	-	1	-	7
Released Catch										
- Chinook	-	-	-	-	-	-	-	1	-	6
- Chinook jack	-	-	-	-	-	-	-	-	-	1
Inspection of Catch										
- Number	4	3	-	-	1	3	4	5	2	77
- Number correct	4	3	-	-	1	3	4	5	2	77
Gear										
- Lure	61	57	26	14	12	57	32	37	36	1,045
1989 Previous Angling in lower Fraser River										
- No. who fished CN previously	38	48	20	12	10	45	24	24	26	784
- Mean angler day length (hr) b	9.1	11.3	9.4	8.3	8.0	9.2	10.9	9.3	8.0	9.6
- Harvest: b										
Chinook adult	7	7	4	1	1	3	5	1	1	130
Chinook jack	-	-	-	-	-	-	-	-	-	2

a. C - clear; O - overcast; R - rain.
b. On most recent trip.

Appendix 2. Daily angler counts in the June and July 1989 lower Fraser River sport fishery.

Month	Date	Day of week	Weather	Mean angler count: Sumas River to Harrison River a	Mean angler count: Queen's Island Bar	Mean angler count: Harrison River to Agassiz-Rosedale powerline	Mean angler count: Total
June	04-Jun	Sun	Sunny	35	68	12	115
	06-Jun	Tue	Sunny	6	14	0	20
	10-Jun	Sat	Overcast	34	22	5	61
	16-Jun	Fri	Rain	8	16	7	31
	21-Jun	Wed	Overcast	13	24	4	41
	25-Jun	Sun	Sunny	58	114	48	220
	29-Jun	Thu	Overcast	31	72	20	123
	Weekday	Mean	-	15	32	8	54
		%	-	27.0%	58.6%	14.4%	-
	Weekend	Mean	-	42	68	22	132
		%	-	32.1%	51.5%	16.4%	-
July	02-Jul	Sun	Sunny	129	174	59	362
	07-Jul	Fri	Sunny	51	77	27	155
	09-Jul	Sun	Sunny	125	117	36	278
	12-Jul	Wed	Sunny	19	34	30	83
	15-Jul	Sat	Overcast	130	79	46	255
	17-Jul	Mon	Overcast	22	46	1	69
	18-Jul	Tue	Sunny	53	44	54	151
	22-Jul	Sat	Sunny	129	62	49	240
	27-Jul	Thu	Overcast	48	33	36	117
	Weekday	Mean	-	39	47	30	115
		%	-	33.6%	40.7%	25.7%	
	Weekend	Mean	-	128	108	48	284
		%	-	45.2%	38.1%	16.7%	-

a. Excludes Queen's Island Bar.

Appendix 3. Mean proportion of daily angler effort per hour in the 1989 lower Fraser, Quesnel, lower Shuswap and Thompson River (Spences Bridge) sport fisheries.

	Lower Fraser River							Thompson River		
	June		July		Quesnel River a	Lower Shuswap River				
Hour	Weekday	Weekend	Weekday	Weekend	Weekend	Weekday	Weekend	Nicola River mouth b	Nicola River mouth c	Martel
100	0.000	0.000	0.000	0.001	-	0.008	0.003	0.000	0.000	0.000
200	0.000	0.000	0.000	0.001	-	0.010	0.005	0.000	0.000	0.000
300	0.000	0.000	0.000	0.001	-	0.014	0.007	0.000	0.000	0.000
400	0.002	0.004	0.003	0.001	-	0.020	0.015	0.000	0.000	0.000
500	0.012	0.015	0.014	0.015	-	0.044	0.038	0.000	0.000	0.000
600	0.024	0.026	0.029	0.033	-	0.054	0.059	0.137	0.144	0.007
700	0.035	0.033	0.039	0.043	0.033	0.061	0.065	0.138	0.150	0.074
800	0.035	0.051	0.039	0.043	0.052	0.050	0.061	0.146	0.168	0.133
900	0.052	0.065	0.064	0.060	0.046	0.042	0.049	0.143	0.135	0.133
1000	0.075	0.076	0.073	0.069	0.039	0.038	0.034	0.113	0.108	0.141
1100	0.083	0.076	0.082	0.084	0.102	0.037	0.031	0.121	0.084	0.178
1200	0.083	0.092	0.078	0.089	0.072	0.040	0.027	0.090	0.033	0.141
1300	0.079	0.088	0.080	0.088	0.082	0.041	0.037	0.068	0.021	0.111
1400	0.079	0.081	0.079	0.083	0.108	0.044	0.047	0.045	0.015	0.081
1500	0.081	0.068	0.076	0.070	0.138	0.039	0.042	0.000	0.027	0.000
1600	0.077	0.080	0.071	0.073	0.072	0.045	0.034	0.000	0.024	0.000
1700	0.065	0.068	0.060	0.062	0.089	0.049	0.044	0.000	0.024	0.000
1800	0.061	0.059	0.058	0.058	0.062	0.065	0.060	0.000	0.024	0.000
1900	0.065	0.049	0.064	0.052	0.059	0.088	0.082	0.000	0.009	0.000
2000	0.062	0.044	0.056	0.047	0.020	0.080	0.086	0.000	0.021	0.000
2100	0.026	0.021	0.030	0.024	0.026	0.067	0.080	0.000	0.012	0.000
2200	0.003	0.003	0.006	0.002	0.000	0.037	0.053	0.000	0.000	0.000
2300	0.000	0.000	0.000	0.000	-	0.020	0.031	0.000		0.000
2400	0.000	0.000	0.000	0.000	-	0.006	0.010	0.000		0.000

a. Effort profile tails not assessed.
b. July 8-30; fishery open 0600h to 1400h.
c. August 6-27; fishery open 0600h to 2100h.

Appendix 4. Daily catch (harvest and release) per angler hour at Queen's Island in the June and July 1989 lower Fraser River sport fishery.

June				July			
Date	Chinook adult	Chinook jack	Sockeye	Date	Chinook adult	Chinook jack	Sockeye
03-Jun	0.0146	0.0000	0.0000	01-Jul	0.0095	0.0009	0.0000
04-Jun	0.0203	0.0000	0.0000	02-Jul	0.0142	0.0000	0.0000
05-Jun	0.0056	0.0000	0.0000	03-Jul	0.0078	0.0013	0.0000
06-Jun	0.0092	0.0000	0.0000	06-Jul	0.0106	0.0000	0.0000
08-Jun	0.0000	0.0000	0.0000	07-Jul	0.0108	0.0022	0.0000
10-Jun	0.0000	0.0000	0.0000	08-Jul	0.0048	0.0000	0.0000
11-Jun	0.0000	0.0000	0.0000	09-Jul	0.0219	0.0026	0.0000
12-Jun	0.0000	0.0000	0.0000	10-Jul	0.0105	0.0000	0.0000
15-Jun	0.0190	0.0000	0.0000	11-Jul	0.0045	0.0022	0.0000
16-Jun	0.0532	0.0000	0.0000	14-Jul	0.0204	0.0000	0.0000
17-Jun	0.0153	0.0000	0.0000	15-Jul	0.0086	0.0000	0.0000
18-Jun	0.0000	0.0000	0.0000	16-Jul	0.0064	0.0000	0.0000
19-Jun	0.0405	0.0000	0.0000	19-Jul	0.0000	0.0000	0.0000
20-Jun	0.0256	0.0000	0.0000	20-Jul	0.0000	0.0000	0.0000
23-Jun	0.0229	0.0000	0.0000	21-Jul	0.0099	0.0000	0.0000
24-Jun	0.0337	0.0000	0.0000	22-Jul	0.0052	0.0026	0.0000
25-Jun	0.0492	0.0000	0.0000	23-Jul	0.0231	0.0000	0.0000
28-Jun	0.0296	0.0000	0.0000	26-Jul	0.0204	0.0041	0.0000
29-Jun	0.0311	0.0072	0.0024	27-Jul	0.0098	0.0000	0.0000
30-Jun	0.0316	0.0063	0.0000				
Total a							
HPUE	0.0229	0.0007	0.0000		0.0106	0.0009	0.0000
RPUE	0.0028	0.0001	0.0001		0.0007	0.0001	0.0000
Combined	0.0256	0.0008	0.0001		0.0113	0.0010	0.0000

a. Weighted; see Methods.

Appendix 5. Verification of the accuracy of anglers in recalling trip length and predicting subsequent trip length in the 1989 lower Fraser River and lower Shuswap River sport fisheries.

Angler estimate deviated from actual time by (hours):	Lower Fraser River		Lower Shuswap River	
	Angler recall of trip length	Angler prediction of subsequent trip length	Angler recall of trip length	Angler prediction of subsequent trip length
14.1 to 15.0	-	-	-	1
13.1 to 14.0	-	-	-	-
12.1 to 13.0	-	-	-	-
11.1 to 12.0	-	1	-	-
10.1 to 11.0	-	-	-	-
9.1 to 10.0	-	2	-	-
8.1 to 9.0	-	-	-	-
7.1 to 8.0	-	2	-	-
6.1 to 7.0	-	2	-	-
5.1 to 6.0	-	3	-	-
4.1 to 5.0	-	4	-	-
3.1 to 4.0	-	5	-	1
2.1 to 3.0	1	4	-	3
1.1 to 2.0	2	4	8	7
0.1 to 1.0	17	8	33	28
0	7	2	8	8
-0.1 to -1.0	13	2	26	3
-1.1 to -2.0	-	1	1	-
-2.1 to -3.0	-	-	4	-
-3.1 to -4.0	-	-	1	-
Sample size	40	40	81	51
Mean deviation from actual time (hrs.)	+0.2	+3.2	0.0	+0.8

Appendix 6. Interview responses by day in the roving survey of the 1989 upper Quesnel River sport fishery.

	05-Aug	06-Aug	12-Aug	13-Aug	19-Aug	20-Aug	26-Aug	27-Aug	02-Sep	03-Sep
Number of Interviews	6	8	15	18	7	18	15	6	17	11
Weather a	C	C	C	C	O	R	C	O	O	C
Mean Angler Day Length (hr.)										
- All anglers	4.4	5.8	4.9	4.6	4.1	2.9	2.9	1.3	4.5	5.7
- Complete trip interviews										
Number	2	2	1	4	0	0	4	5	4	0
Hours	6.5	1.5	1.5	1.5	-	-	0.8	0.5	3.8	-
- Incomplete trip interviews										
Number	4	6	14	14	7	18	11	1	13	11
Hours	3.4	7.2	5.2	5.0	4.1	2.9	3.7	5.5	4.8	5.7
Mean number of anglers per party	2.0	2.5	1.9	4.1	1.9	2.7	2.7	2.3	2.0	2.4
Target Species										
- Chinook	2	6	11	9	2	13	7	4	8	5
- Rainbow	4	2	2	9	5	5	8	2	5	4
- Dolly Varden	-	-	-	-	-	-	-	-	2	-
- Anything	-	-	2	-	-	-	-	-	2	2
Harvested Catch										
- Chinook	-	-	1	-	-	-	-	-	-	-
- Sockeye	-	-	-	1	-	-	-	-	-	-
- Rainbow	1	1	-	-	-	-	1	-	3	4
- Whitefish	-	-	-	1	-	-	-	-	-	-
- Unknown	-	-	1	-	-	-	-	-	-	-
Released Catch	-	-	-	-	-	-	-	-	-	-
Inspection of Catch										
- Number	1	0	1	1	0	0	0	0	3	4
- Number correct	1	-	1	0	-	-	-	-	3	4
Gear										
- Bait	1	-	2	-	-	2	8	1	2	4
- Lure	-	1	6	8	1	4	7	1	6	3
- Bait/lure	2	6	7	10	4	9	-	3	8	3
- Fly	3	1	-	-	2	3	-	1	1	1
1989 Previous Angling on Quesnel River										
- No. who fished CR previously	0	1	3	5	2	2	5	0	2	5
- Mean angler day length (hr) b	-	3.0	3.7	2.4	10.0	8.5	10.0	-	2.0	6.8
- Harvest: b										
Chinook adult	-	-	3	-	-	-	-	-	-	1
Rainbow	-	-	-	-	18	-	35	-	-	-

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Continued

Appendix 6. Interview responses by day from the roving survey of the 1989 upper Quesnel River sport fishery, continued.

	09-Sep	10-Sep	Total
Number of Interviews	4	1	126
Weather a	C	C	-
Mean Angler Day Length (hr.)			
- All anglers	0.5	2.0	4.0
- Complete trip interviews			
Number	4	1	27
Hours	0.5	2.0	2.0
- Incomplete trip interviews			
Number	0	0	99
Hours	-	-	4.6
Mean number of anglers per party	2.5	1.0	2.6
Target Species			
- Chinook	4	1	72
- Rainbow	-	-	46
- Dolly Varden	-	-	2
- Anything	-	-	6
Harvested Catch			
- Chinook	2	2	5
- Sockeye	-	-	1
- Rainbow	-	-	10
- Whitefish	-	-	1
- Unknown	-	-	1
Released Catch	-	-	0
Inspection of Catch			
- Number	2	2	14
- Number correct	2	2	13
Gear			
- Bait	1	1	22
- Lure	-	-	37
- Bait/lure	3	-	55
- Fly	-	-	12
1989 Previous Angling on Quesnel River			
- No. who fished CR previously	0	0	25
- Mean angler day length (hr) b	-	-	6.0
- Harvest: b			
Chinook adult	-	-	4
Rainbow	-	-	53

a. C - clear; O - overcast; R - rain.
b. On most recent trip.

Appendix 7. Daily angler counts in the 1989 upper Quesnel River sport fishery.

Date	Day of week	Time	Region a						Total
			1	2	3	4	5	6	
05-Aug	Sat	1301-1400	2	4	0	0	4	7	17
		1701-1800	3	0	0	0	0	3	6
06-Aug	Sun	0601-0700	0	0	0	0	0	5	5
		1001-1100	5	0	0	0	2	7	14
12-Aug	Sat	0701-0800	0	0	0	2	0	6	8
		1201-1300	10	0	0	6	2	7	25
13-Aug	Sun	1601-1700	5	0	0	3	0	4	12
		2001-2100	0	0	0	4	0	0	4
19-Aug	Sat	1501-1600	9	0	0	8	0	0	17
		1801-1900	2	0	0	0	0	4	6
20-Aug	Sun	1001-1100	8	0	0	8	0	1	17
		1301-1400	5	0	0	2	0	9	16
26-Aug	Sat	1401-1500	3	0	0	5	1	5	14
		1701-1800	4	0	0	3	0	6	13
27-Aug	Sun	0801-0900	0	0	0	5	0	2	7
		1101-1200	6	0	0	3	0	2	11
02-Sep	Sat	1401-1500	8	2	6	2	2	8	28
		2101-2200	0	0	0	0	0	0	0
03-Sep	Sun	1601-1700	2	0	0	8	3	2	15
		1801-1900	0	0	0	8	0	4	12
09-Sep	Sat	0901-1000	0	0	0	0	0	0	0
		1101-1200	0	0	0	0	0	0	0
10-Sep	Sun	1501-1600	3	0	0	2	0	0	5
		1901-2000	0	0	0	3	0	0	3
Average	-	-	3	0	0	3	1	3	11
% total	-	-	29.4%	2.4%	2.4%	28.2%	5.5%	32.2%	-

a. Regions were:

1 - Quesnel Lake to end of south side access road.
2 - End of road to Likely Bridge, north side.
3 - End of road to Likely Bridge, south side.
4 - Likely Bridge to Drop Creek, north side.
5 - Likely Bridge to Drop Creek, south side.
6 - Drop Creek to 500 m above Cariboo River confluence.

Appendix 8. Daily catch (harvest and release) per angler hour in the 1989 upper Quesnel River sport fishery.

Date	Chinook adult	Rainbow	Sockeye	Whitefish
05-Aug	0.0000	0.0476	0.0000	0.0000
06-Aug	0.0000	0.0667	0.0000	0.0000
12-Aug	0.0500	0.0000	0.0000	0.0000
13-Aug	0.0000	0.0000	0.0185	0.0185
19-Aug	0.0000	0.0000	0.0000	0.0000
20-Aug	0.0000	0.0000	0.0000	0.0000
26-Aug	0.0000	0.0526	0.0000	0.0000
27-Aug	0.0000	0.0000	0.0000	0.0000
02-Sep	0.0000	0.0822	0.0000	0.0000
03-Sep	0.0000	0.1270	0.0000	0.0000
09-Sep	1.0000	0.0000	0.0000	0.0000
10-Sep	1.0000	0.0000	0.0000	0.0000
Total				
HPUE	0.0218	0.0433	0.0043	0.0043
RPUE	0.0000	0.0000	0.0000	0.0000
Combined	0.0218	0.0433	0.0043	0.0043

Appendix 9a. Interview responses by day at Chuck's Pool in the 1989 lower Shuswap River sport fishery.

	16-Aug	17-Aug	18-Aug	19-Aug	20-Aug	23-Aug	24-Aug	25-Aug	26-Aug	27-Aug
Number of Interviews	36	26	8	18	15	19	18	26	24	25
Weather a	R	C	C	O	O	O	C	C	O	C
Mean Angler Day Length (hr.)										
- All anglers	4.3	3.6	3.2	5.1	4.4	4.7	4.8	4.4	5.4	6.7
- Complete trip interviews										
Number	28	19	5	4	7	7	12	14	13	10
Hours	4.2	3.7	2.0	3.6	4.5	3.7	2.2	2.7	4.1	4.3
- Incomplete trip interviews										
Number	8	7	3	14	8	12	6	12	11	15
Hours	4.6	3.3	5.2	5.5	4.4	5.3	10.2	6.4	6.9	8.3
Mean number of anglers per party	1.6	1.9	1.3	1.6	1.3	1.7	2.1	1.7	2.5	1.6
Target Species										
- Chinook	36	26	8	17	15	19	18	26	24	25
- Rainbow	-	-	-	1	-	-	-	-	-	-
Harvested Catch										
- Chinook	2	-	-	1	-	2	-	2	-	2
- Chinook, adipose clipped	1	-	-	1	-	-	-	-	-	-
- Chinook jack	-	-	-	-	-	-	-	-	-	-
Released Catch										
- Chinook jack	-	-	-	-	-	-	-	-	-	-
Inspection of Catch										
- Number	2	0	0	2	0	2	0	2	0	1
- Number correct	2	-	-	2	-	2	-	2	-	0
Gear										
- Bait	5	1	1	3	-	2	3	1	5	6
- Lure	18	21	7	12	14	16	12	20	11	16
- Bait/lure	13	4	-	2	1	1	3	5	8	3
- Fly	-	-	-	1	-	-	-	-	-	-
1989 Previous Angling on lower Shuswap River										
- No. who fished CR previously	0	6	5	8	11	6	5	19	9	20
- Mean angler day length (hr) b	-	4.5	3.3	5.8	4.6	5.3	4.5	5.1	4.2	5.9
- Harvest: b										
Chinook adult	-	1	1	-	-	-	-	3	-	-

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Continued

Appendix 9a. Interview responses by day at Chuck's Pool in the 1989 lower Shuswap River sport fishery, continued.

	28-Aug	31-Aug	01-Sep	02-Sep	03-Sep	04-Sep	Total
Number of Interviews	15	17	17	24	22	26	336
Weather a	C	R	0	R	0	0	-
Mean Angler Day Length (hr.)							
- All anglers	3.5	5.0	3.6	4.2	3.9	4.6	4.5
- Complete trip interviews							
Number	4	8	10	12	21	16	190
Hours	2.0	4.1	3.3	3.3	3.7	3.4	3.5
- Incomplete trip interviews							
Number	11	9	7	12	1	10	146
Hours	4.1	5.8	4.1	5.1	9.0	6.5	5.8
Mean number of anglers per party	2.0	1.2	1.4	1.6	1.6	1.5	1.7
Target Species							
- Chinook	15	17	17	24	22	26	335
- Rainbow	-	-	-	-	-	-	1
Harvested Catch							
- Chinook	1	5	-	1	-	3	19
- Chinook, adipose clipped	-	-	-	-	-	-	2
- Chinook jack	-	-	-	-	-	1	1
Released Catch							
- Chinook jack	-	1	-	-	-	-	1
Inspection of Catch							
- Number	0	2	0	0	0	0	11
- Number correct	-	1	-	-	-	-	9
Gear							
- Bait	1	7	4	5	3	4	51
- Lure	12	8	9	14	9	13	212
- Bait/lure	-	2	4	4	9	9	68
- Fly	2	-	-	1	1	-	5
1989 Previous Angling on lower Shuswap River							
- No. who fished CR previously	9	10	8	15	8	22	161
- Mean angler day length (hr) b	3.6	4.3	4.6	5.3	4.9	4.7	4.8
- Harvest: b							
Chinook adult	-	1	-	1	1	3	11

a. C - clear; O - overcast; R - rain.
b. On most recent trip.

Appendix 9b. Interview responses by day at Log Dump Pool in the 1989 lower Shuswap River sport fishery.

	16-Aug	17-Aug	18-Aug	19-Aug	20-Aug	23-Aug	24-Aug	25-Aug	26-Aug	27-Aug
Number of Interviews	24	10	12	14	15	11	12	8	8	10
Weather a	R	C	C	O	O	O	C	C	O	C
Mean Angler Day Length (hr.)										
- All anglers	4.0	5.6	3.8	3.8	3.1	3.5	4.1	3.3	8.0	5.0
- Complete trip interviews										
Number	7	3	4	6	8	5	6	4	0	3
Hours	2.5	5.7	2.3	2.7	2.4	3.2	4.7	2.4	-	3.3
- Incomplete trip interviews										
Number	17	7	8	8	7	6	6	4	8	7
Hours	4.6	5.6	4.5	4.7	3.9	3.8	3.5	4.3	8.0	5.6
Mean number of anglers per party	2.0	2.0	2.6	1.4	2.2	1.7	2.0	1.6	1.9	1.9
Target Species										
- Chinook	22	10	12	14	15	11	12	8	8	10
- Rainbow	1	-	-	-	-	-	-	-	-	-
- Anything	1	-	-	-	-	-	-	-	-	-
Harvested Catch										
- Chinook	1	-	3	-	-	-	-	-	-	-
- Chinook, adipose clipped	-	-	-	-	-	-	1	-	-	-
- Chinook jack	-	-	-	-	-	-	-	-	-	-
- Rainbow	1	-	-	-	-	-	-	-	-	-
Released Catch	-	-	-	-	-	-	-	-	-	-
Inspection of Catch										
- Number	0	-	3	-	-	-	1	-	-	-
- Number correct	-	-	3	-	-	-	1	-	-	-
Gear										
- Bait	4	-	4	-	2	-	2	-	1	1
- Lure	15	5	5	12	12	7	6	7	6	8
- Bait/lure	5	5	3	2	1	4	4	1	1	1
- Fly	-	-	-	-	-	-	-	-	-	-
1989 Previous Angling on lower Shuswap River										
- No. who fished CR previously	0	5	3	3	1	3	2	4	2	0
- Mean angler day length (hr) b	-	6.3	7.8	3.8	6.0	12.7	5.0	5.5	14.0	-
- Harvest: b										
Chinook adult	-	-	-	-	-	-	1	-	-	-
Chinook jack	-	-	-	-	-	-	-	-	-	-

a. C - clear; O - overcast; R - rain.

Continued

Appendix 9b. Interview responses by day at Log Dump Pool in the 1989 lower Shuswap River sport fishery, continued.

	28-Aug	31-Aug	01-Sep	02-Sep	03-Sep	04-Sep	Total
Number of Interviews	8	8	4	8	19	12	183
Weather a	C	R	O	R	O	O	-
Mean Angler Day Length (hr.)							
- All anglers	3.1	3.5	3.5	4.3	4.0	3.9	4.1
- Complete trip interviews							
Number	7	2	2	2	15	3	77
Hours	3.0	2.3	1.3	1.8	3.6	1.7	3.0
- Incomplete trip interviews							
Number	1	6	2	6	4	9	106
Hours	3.5	3.9	5.8	5.1	5.5	4.7	4.9
Mean number of anglers per party	1.1	1.5	2.5	2.6	2.2	1.8	2.0
Target Species							
- Chinook	8	8	4	8	18	12	180
- Rainbow	-	-	-	-	-	-	1
- Anything	-	-	-	-	1	-	2
Harvested Catch							
- Chinook	-	-	1	-	1	-	6
- Chinook, adipose clipped	-	-	-	-	-	-	1
- Chinook jack	-	-	-	1	3	3	7
- Rainbow	-	-	-	-	-	-	1
Released Catch	-	-	-	-	-	-	0
Inspection of Catch							
- Number	-	-	1	0	4	2	11
- Number correct	-	-	1	-	4	2	11
Gear							
- Bait	1	2	1	3	3	4	28
- Lure	6	5	3	4	15	6	122
- Bait/lure	1	1	-	1	-	2	32
- Fly	-	-	-	-	1	-	1
1989 Previous Angling on lower Shuswap River							
- No. who fished CR previously	3	4	3	7	10	8	58
- Mean angler day length (hr) b	18.0	7.3	17.3	8.4	8.8	12.0	9.5
- Harvest: b							
Chinook adult	-	-	-	1	1	2	5
Chinook jack	1	1	-	-	1	3	6

a. C - clear; O - overcast; R - rain.
b. On most recent trip.

Appendix 9c. Interview responses by day at Enderby Bridge in the 1989 lower Shuswap River sport fishery.

	19-Aug	20-Aug	23-Aug	24-Aug	25-Aug	26-Aug	27-Aug
Number of Interviews	22	17	21	16	18	24	20
Weather a	0	0	0	C	C	0	C
Mean Angler Day Length (hr.)							
- All anglers	7.5	5.6	7.3	4.2	5.1	4.6	3.8
- Complete trip interviews							
Number	5	4	5	4	11	3	6
Hours	3.0	2.0	4.5	1.4	4.9	2.3	3.5
- Incomplete trip interviews							
Number	17	13	16	12	7	21	14
Hours	8.8	6.7	8.2	5.1	5.3	4.9	3.9
Mean number of anglers per party	1.6	1.4	1.6	1.1	1.6	1.3	1.9
Target Species							
- Chinook	22	17	21	16	16	21	20
- Anything	-	-	-	-	2	3	-
Harvested Catch							
- Chinook	1	-	-	-	-	-	-
Released Catch	-	-	-	-	-	-	-
Inspection of Catch							
- Number	1	0	0	0	0	0	0
- Number correct	1	-	-	-	-	-	-
Gear							
- Bait	4	7	3	1	2	-	4
- Lure	14	10	15	14	15	21	16
- Bait/lure	4	-	3	1	1	3	-
- Fly	-	-	-	-	-	-	-
1989 Previous Angling on lower Shuswap River							
- No. who fished CN previously	15	11	18	14	14	23	12
- Mean angler day length (hr) b	5.4	8.0	6.2	5.1	4.3	5.0	4.7
- Harvest: b							
Chinook adult	1	1	-	1	-	-	-

a. C - clear; O - overcast; R - rain.

Continued

b. On most recent trip.

Appendix 9c. Interview responses by day at Enderby Bridge in the 1989 lower Shuswap River sport fishery, continued.

	28-Aug	31-Aug	01-Sep	02-Sep	03-Sep	04-Sep	Total
Number of Interviews	26	13	21	12	25	12	247
Weather a	C	R	O	R	O	O	-
Mean Angler Day Length (hr.)							
- All anglers	4.3	5.5	3.7	4.7	4.2	5.8	5.1
- Complete trip interviews							
Number	8	6	16	7	6	5	86
Hours	4.1	4.5	2.9	3.1	1.4	4.0	3.4
- Incomplete trip interviews							
Number	18	7	5	5	19	7	161
Hours	4.3	6.4	6.1	7.0	5.1	7.1	6.0
Mean number of anglers per party	1.5	1.3	1.4	1.7	1.7	1.8	1.5
Target Species							
- Chinook	26	13	21	12	25	12	242
- Anything	-	-	-	-	-	-	5
Harvested Catch							
- Chinook	-	-	-	-	-	-	1
Released Catch	-	-	-	-	-	-	0
Inspection of Catch							
- Number	0	0	0	0	0	0	1
- Number correct	-	-	-	-	-	-	1
Gear							
- Bait	5	2	1	1	-	1	31
- Lure	22	10	19	11	25	11	203
- Bait/lure	1	-	1	-	-	-	14
- Fly	-	1	-	-	-	-	1
1989 Previous Angling on lower Shuswap River							
- No. who fished CN previously	21	12	14	12	23	12	201
- Mean angler day length (hr) b	5.2	5.5	4.6	3.9	4.5	5.9	5.2
- Harvest: b							
Chinook adult	-	-	-	-	1	1	5

a. C - clear; O - overcast; R - rain.
b. On most recent trip.

Appendix 9d. Interview responses by day at Grinrod Bridge in the 1989 lower Shuswap River sport fishery.

	19-Aug	20-Aug	23-Aug	24-Aug	25-Aug	26-Aug	27-Aug
Number of Interviews	9	5	14	7	9	5	7
Weather a	0	0	0	C	C	0	C
Mean Angler Day Length (hr.)							
- All anglers	5.3	6.7	4.5	2.5	5.2	2.4	5.5
- Complete trip interviews							
Number	5	4	7	4	4	1	7
Hours	2.6	7.3	3.1	2.4	3.3	1.5	5.5
- Incomplete trip interviews							
Number	4	1	7	3	5	4	0
Hours	8.8	4.5	5.9	2.7	6.7	2.6	-
Mean number of anglers per party	1.2	2.4	1.6	1.4	1.7	1.6	1.3
Target Species							
- Chinook	9	5	14	7	9	5	7
Harvested Catch							
- Chinook	-	-	-	-	-	-	1
Released Catch	-	-	-	-	-	-	-
Inspection of Catch							
- Number	0	0	0	0	0	0	0
- Number correct	-	-	-	-	-	-	-
Gear							
- Bait	-	-	-	-	-	-	-
- Lure	9	5	14	7	9	5	7
- Bait/lure	-	-	-	-	-	-	-
- Fly	-	-	-	-	-	-	-
1989 Previous Angling on lower Shuswap River							
- No. who fished CN previously	4	3	7	4	4	0	3
- Mean angler day length (hr) b	7.0	6.0	8.1	20.3	5.8	-	5.3
- Harvest: b							
Chinook adult	-	-	-	2	-	-	1

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Continued

Appendix 9d. Interview responses by day at Grinrod Bridge in the 1989 lower Shuswap River sport fishery, continued.

	28-Aug	31-Aug	01-Sep	02-Sep	03-Sep	04-Sep	Total
Number of Interviews	6	7	8	1	7	12	97
Weather a	C	R	O	R	O	O	-
Mean Angler Day Length (hr.)							
- All anglers	4.4	4.1	2.1	2.0	3.1	7.2	4.6
- Complete trip interviews							
Number	4	2	8	1	3	12	62
Hours	5.1	0.8	2.1	2.0	2.0	7.2	3.1
- Incomplete trip interviews							
Number	2	5	0	0	4	0	35
Hours	3.0	5.5	-	-	4.0	-	5.7
Mean number of anglers per party	1.7	1.6	1.5	1.0	1.7	1.6	1.6
Target Species							
- Chinook	6	7	8	1	7	12	97
Harvested Catch							
- Chinook	-	-	-	-	-	-	1
Released Catch	-	-	-	-	-	-	0
Inspection of Catch							
- Number	0	0	0	0	0	0	0
- Number correct	-	-	-	-	-	-	0
Gear							
- Bait	-	-	-	-	-	-	0
- Lure	6	7	8	1	7	12	97
- Bait/lure	-	-	-	-	-	-	0
- Fly	-	-	-	-	-	-	0
1989 Previous Angling on lower Shuswap River							
- No. who fished CN previously	3	5	7	0	4	11	55
- Mean angler day length (hr) b	15.3	13.6	3.1	-	1'	12.6	10.2
- Harvest: b							
Chinook adult	2	-	-	-	-	-	5

a. C - clear; O - overcast; R - rain.
b. On most recent trip.

Appendix 9e. Interview responses by day in the roving survey of the 1989 lower Shuswap River sport fishery.

	16-Aug	17-Aug	18-Aug	19-Aug	20-Aug	23-Aug	24-Aug	25-Aug	26-Aug	27-Aug
Number of Interviews	30	21	24	22	35	14	13	8	21	21
Weather a	R	C	C	O	O	O	C	C	O	C
Mean Angler Day Length (hr.)										
- All anglers	4.4	6.1	6.6	6.2	6.3	5.2	4.8	5.6	6.8	5.3
- Complete trip interviews										
Number	3	0	3	9	4	1	3	0	3	2
Hours	3.3	-	2.0	3.4	3.3	1.0	3.0	-	1.0	1.8
- Incomplete trip interviews										
Number	27	21	21	13	31	13	10	8	18	19
Hours	4.5	6.1	7.3	8.1	6.6	5.5	5.4	5.6	7.8	5.7
Mean number of anglers per party	1.9	1.8	1.7	2.1	2.1	1.7	1.9	1.8	2.2	1.9
Target Species										
- Chinook	30	21	21	20	35	13	8	7	21	18
- Rainbow	-	-	3	2	-	1	5	1	-	2
- Anything	-	-	-	-	-	-	-	-	-	1
Harvested Catch										
- Chinook	-	-	1	1	-	-	-	-	-	-
- Chinook jack	-	-	-	-	-	-	-	-	-	1
- Rainbow	-	-	-	1	-	-	2	-	-	-
Released Catch										
- Chinook jack	-	-	-	-	1	-	-	-	-	-
Inspection of Catch										
- Number	0	0	0	2	0	0	0	0	0	1
- Number correct	-	-	-	2	-	-	-	-	-	1
Gear										
- Bait	7	2	3	3	1	3	3	3	6	5
- Lure	20	10	11	11	24	11	8	4	14	13
- Bait/lure	3	9	9	8	10	-	2	1	1	3
- Fly	-	-	1	-	-	-	-	-	-	-
1989 Previous Angling on lower Shuswap River										
- No. who fished CR previously	0	12	17	7	18	13	9	7	14	15
- Mean angler day length (hr) b	-	4.3	5.7	9.1	7.1	4.7	3.8	4.0	3.4	4.6
- Harvest: b										
Chinook adult	-	1	2	-	-	-	-	-	-	-
Rainbow	-	1	-	-	-	-	-	-	-	-
Whitefish	-	-	20	-	-	-	-	-	-	-
Squawfish	-	-	-	-	-	-	6	1	2	6

a. C - clear; O - overcast; R - rain.

b. On most recent trip.

Continued

Appendix 9e. Interview responses by day in the roving survey of the 1989 lower Shuswap River sport fishery, continued.

	28-Aug	31-Aug	01-Sep	02-Sep	03-Sep	04-Sep	Total
Number of Interviews	14	6	12	4	17	11	273
Weather a	C	R	O	R	O	O	-
Mean Angler Day Length (hr.)							
- All anglers	4.9	7.8	4.5	13.0	4.1	8.4	5.8
- Complete trip interviews							
Number	1	0	2	0	1	0	32
Hours	4.5	-	3.5	-	0.5	-	2.8
- Incomplete trip interviews							
Number	13	6	10	4	16	11	241
Hours	5.0	7.8	4.7	13.0	4.3	8.4	6.2
Mean number of anglers per party	1.6	2.3	1.7	2.0	2.2	1.9	1.9
Target Species							
- Chinook	12	4	12	4	15	11	252
- Rainbow	-	2	-	-	2	-	18
- Anything	2	-	-	-	-	-	3
Harvested Catch							
- Chinook	-	-	-	-	-	-	2
- Chinook jack	-	-	-	-	-	-	1
- Rainbow	-	-	-	-	-	-	3
Released Catch							
- Chinook jack	-	-	-	-	-	-	1
Inspection of Catch							
- Number	0	0	0	0	0	0	3
- Number correct	-	-	-	-	-	-	3
Gear							
- Bait	2	-	-	-	11	-	49
- Lure	10	5	12	4	4	9	170
- Bait/lure	2	1	-	-	2	2	53
- Fly	-	-	-	-	-	-	1
1989 Previous Angling on lower Shuswap River							
- No. who fished CR previously	9	6	10	4	16	9	166
- Mean angler day length (hr) b	5.0	3.0	3.5	9.0	3.4	6.7	5.0
- Harvest: b							
Chinook adult	-	-	-	-	-	2	5
Rainbow	-	-	-	-	1	-	2
Whitefish	-	-	-	-	1	-	21
Squawfish	-	-	-	-	-	-	15

a. C - clear; O - overcast; R - rain.
b. On most recent trip.

Appendix 10a. Daily angler counts by area in the Mara Lake to Ashton Creek section of the 1989 Lower Shuswap River sport fishery.

Date	Day of week	Time	Mara Lake to Ashton Creek Bridge a				
			1	2 b	3 c	4	Total
16-Aug	Wed	1745-1959	6	19	4	2	31
17-Aug	Thu	1833-2029	14	13	17	9	53
18-Aug	Fri	0552-0820	8	3	12	4	27
19-Aug	Sat	0628-0732	10	5	11	2	28
20-Aug	Sun	1846-1944	18	20	7	7	52
23-Aug	Wed	0545-0707	3	2	6	2	13
24-Aug	Thu	1800-1900	6	5	13	1	25
25-Aug	Fri	0557-0657	3	2	9	0	14
26-Aug	Sat	1800-1900	4	2	9	6	21
27-Aug	Sun	0606-0727	2	2	7	6	17
28-Aug	Mon	1759-1854	3	4	6	5	18
31-Aug	Thu	0616-0721	3	1	4	1	9
01-Sep	Fri	1741-1858	5	2	17	4	28
02-Sep	Sat	0621-0723	0	1	3	1	5
03-Sep	Sun	1759-1916	3	3	17	4	27
04-Sep	Mon	0603-0729	0	1	5	0	7
Weekday	Mean	-	6	6	10	3	24
	% d	-	8.7%	8.7%	15.0%	4.8%	37.1%
Weekend	Mean	-	5	5	9	4	22
	% d	-	7.2%	6.6%	11.7%	5.1%	30.5%

a. Areas were: 1 - Mara Lake to Mara Bridge.
2 - Mara Bridge to Grinrod Bridge.
3 - Grinrod Bridge to Enderby Bridge.
4 - Enderby Bridge to Ashton Creek Bridge.

b. Includes Grinrod Bridge site.

c. Includes Enderby Bridge site.

d. Total includes counts in the river between Ashton Creek to Mable Lake; see Appendix 10b.

Appendix 10b. Daily angler counts by area in the Ashton Creek to Mable Lake section of the 1989 lower Shuswap River sport fishery.

Date	Day of week	Time	Ashton Creek Bridge to Mable Lake a						Lower Shuswap River total d
			1	2 b	3	4	5 c	Total	
16-Aug	Wed	1745-1959	4	25	2	0	23	54	85
17-Aug	Thu	1833-2029	9	25	4	0	23	61	114
18-Aug	Fri	0552-0820	4	17	4	0	14	39	66
19-Aug	Sat	0628-0732	4	18	2	0	27	51	79
20-Aug	Sun	1846-1944	5	11	2	0	16	34	86
23-Aug	Wed	0545-0707	6	19	0	0	20	45	58
24-Aug	Thu	1800-1900	1	17	2	0	17	37	62
25-Aug	Fri	0557-0657	6	9	1	0	17	33	47
26-Aug	Sat	1800-1900	8	19	0	0	27	54	75
27-Aug	Sun	0606-0727	14	14	3	0	29	60	77
28-Aug	Mon	1759-1854	4	11	2	0	11	28	46
31-Aug	Thu	0616-0721	15	8	2	0	15	40	49
01-Sep	Fri	1741-1858	8	5	0	0	19	32	60
02-Sep	Sat	0621-0723	5	13	0	0	17	35	40
03-Sep	Sun	1759-1916	9	17	0	3	32	61	88
04-Sep	Mon	0603-0729	13	12	1	0	36	62	69
Weekday	Mean	-	6	15	2	0	18	41	65
	% d	-	9.7%	23.2%	2.9%	0.0%	27.1%	62.9%	-
Weekend	Mean	-	8	15	1	0	26	51	73
	% d	-	11.3%	20.2%	1.6%	0.6%	35.8%	69.5%	-

a. Areas were: 1 - Ashton Creek Bridge to Fall Creek.
2 - Fall Creek to Cooke Creek.
3 - Cooke Creek to Delorme Creek.
4 - Delorme Creek to Skookumchuck.
5 - Skookumchuck to Mabel Lake.

b. Includes Log Dump Pool site.

c. Includes Chuck's Pool site.

d. Total includes counts in the river between Ashton Creek to Mable Lake; see Appendix 10a.

Appendix 11. Daily catch (harvest and release) per angler hour in the 1989 lower Shuswap River sport fishery.

	Grinrod Bridge	Enderby Bridge	Cook Creek Pool			Chuck's Pool		Roving survey		
Date	Chinook	Chinook	Chinook	Chinook jack	Rainbow	Chinook	Chinook jack	Chinook	Chinook jack	Rainbow
16-Aug	0.0000	0.0167	0.0163	0.0000	0.0163	0.0225	0.0000	0.0000	0.0000	0.0000
17-Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
18-Aug	0.0000	0.0000	0.0909	0.0000	0.0000	0.0000	0.0000	0.0138	0.0000	0.0000
19-Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0426	0.0000	0.0140	0.0000	0.0140
20-Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0069	0.0000
23-Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0308	0.0000	0.0000	0.0000	0.0000
24-Aug	0.0000	0.0000	0.0256	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0833
25-Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0303	0.0000	0.0000	0.0000	0.0000
26-Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
27-Aug	0.0690	0.0000	0.0000	0.0000	0.0000	0.0220	0.0000	0.0000	0.0000	0.0256
28-Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.0299	0.0000	0.0000	0.0000	0.0000
31-Aug	0.0000	0.0000	0.0000	0.0000	0.0000	0.1042	0.0208	0.0000	0.0000	0.0000
01-Sep	0.0000	0.0000	0.0952	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
02-Sep	0.0000	0.0000	0.0000	0.0588	0.0000	0.0167	0.0000	0.0000	0.0000	0.0000
03-Sep	0.0000	0.0000	0.0154	0.0462	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
04-Sep	0.0000	0.0000	0.0000	0.1364	0.0000	0.0328	0.0109	0.0000	0.0000	0.0000
Total a										
HPUE	0.0035	0.0012	0.0148	0.0133	0.0022	0.0186	0.0008	0.0026	0.0011	0.0041
RPUE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0008	0.0000	0.0011	0.0000
Combined	0.0035	0.0012	0.0148	0.0133	0.0022	0.0186	0.0016	0.0026	0.0022	0.0041

a. Weighted; see Methods.

Appendix 12. Mean nose-fork length and weight, by flesh colour, age and sex of chinook salmon harvested in the 1989 lower Shuswap River sport fishery.

Flesh color	Sex	Age	Sample size	%	Mean length cm)	Mean weight (kg)
Red	Male	5/1	0	0.0%	-	-
		4/2	1	14.3%	73.0	4.5
		4/1	1	14.3%	62.0	3.2
		3/1	1	14.3%	63.0	3.2
		2/1	4	57.1%	41.3	0.9
		Unknown	7	-	76.6	7.1
		Total	14	-	64.3	4.5
	Female	5/1	4	40.0%	94.8	10.9
		4/2	1	10.0%	72.0	4.3
		4/1	3	30.0%	84.3	8.3
		3/1	2	20.0%	69.8	4.2
		2/1	0	0.0%	-	-
		Unknown	11	-	73.4	6.1
		Total	21	-	78.6	7.1
	Total a	5/1	4	23.5%	94.8	10.9
		4/2	2	11.8%	72.5	4.4
		4/1	4	23.5%	78.8	7.0
		3/1	3	17.6%	67.5	3.9
		2/1	4	23.5%	41.3	0.9
		Unknown	19	-	75.2	6.6
		Total	36	-	73.2	6.2

a. Sex was not recorded for 1 sample.

Appendix 13a. Interview responses by day at Banana Island in the 1989 South Thompson River sport fishery.

	30-Aug	31-Aug	02-Sep	03-Sep	04-Sep	07-Sep	08-Sep	09-Sep	10-Sep	11-Sep	Total
Number of Interviews	1	13	1	19	14	5	8	7	7	1	76
Weather a	O	R	R	O	R	C	C	C	C	-	-
Mean Angler Day Length (hr.)											
- All anglers	8.0	3.2	5.5	3.8	4.4	2.8	2.4	2.6	4.4	0.5	3.6
- Complete trip interviews											
Number	0	11	0	14	8	3	7	6	0	1	50
Hours	-	2.5	-	3.4	2.9	1.7	2.2	2.5	-	0.5	2.7
- Incomplete trip interviews											
Number	1	2	1	5	6	2	1	1	7	0	26
Hours	8.0	6.8	5.5	4.9	6.5	4.5	3.5	3.5	4.4	-	5.3
Mean number of anglers per party	1.0	1.8	2.0	1.8	1.7	1.0	1.8	1.6	1.6	1.0	1.7
Target Species											
- Chinook	1	13	1	19	14	5	7	7	7	1	75
- Rainbow	-	-	-	-	-	-	1	-	-	-	1
Harvested Catch											
- Chinook	-	3	2	-	1	-	-	-	-	-	6
- Chinook jack	-	-	-	-	-	-	1	-	-	-	1
Released Catch											
- Chinook jack	-	-	-	-	-	-	1	-	-	-	1
Inspection of Catch											
- Number	0	3	2	0	1	0	1	0	0	0	7
- Number correct	-	3	2	-	1	-	1	-	-	-	7
Gear											
- Bait	-	-	-	-	-	-	2	3	1	-	6
- Lure	1	13	1	19	14	5	5	4	6	1	69
- Bait/lure	-	-	-	-	-	-	1	-	-	-	1
- Fly	-	-	-	-	-	-	-	-	-	-	0

a. C - clear; O - overcast; R - rain.

Appendix 13b. Interview responses by day in the roving survey of the 1989 South Thompson River sport fishery.

	30-Aug	31-Aug	02-Sep	03-Sep	04-Sep	07-Sep	08-Sep	09-Sep	10-Sep	11-Sep	Total
Number of Interviews	65	51	41	83	82	24	21	40	68	30	505
Weather a	O	R	R	O	R	C	C	C	C	-	-
Mean Angler Day Length (hr.)											
- All anglers	5.2	7.8	7.1	6.5	7.0	5.1	6.8	8.2	9.0	9.1	7.2
- Complete trip interviews											
Number	O	4	O	7	7	O	3	5	O	O	26
Hours	-	3.0	-	5.7	3.7	-	3.0	6.2	-	-	4.5
- Incomplete trip interviews											
Number	65	46	41	76	75	24	18	35	68	30	478
Hours	5.2	8.2	7.1	6.6	7.3	5.1	7.5	8.4	9.0	9.1	7.3
Mean number of anglers per party	2.2	1.9	2.0	2.2	2.2	2.0	1.9	2.0	2.3	2.0	2.1
Target Species											
- Chinook	65	51	40	83	82	24	17	40	68	30	500
- Rainbow	-	-	1	-	-	-	1	-	-	-	2
- Anything	-	-	-	-	-	-	3	-	-	-	3
Harvested Catch											
- Chinook	6	3	4	10	7	-	-	1	2	-	33
- Chinook jack	-	-	1	-	-	-	-	-	2	-	3
Released Catch											
- Chinook jack	-	-	-	-	2	-	-	-	-	-	2
Inspection of Catch											
- Number	1	2	4	6	O	O	O	O	2	O	15
- Number correct	1	2	4	6	-	-	-	-	2	-	15
Gear											
- Bait	5	-	1	1	-	3	-	-	1	1	12
- Lure	53	45	38	77	81	21	21	33	59	23	451
- Bait/lure	7	6	2	5	1	-	-	7	8	6	42
- Fly	-	-	-	-	-	-	-	-	-	-	O

a. C - clear; O - overcast; R - rain.

Appendix 14. Daily angler counts by area in the 1989 South Thompson River sport fishery.

Date	Day of week	Time	Area a				Total
			1	2	3 b	4	
30-Aug	Wed	1320-1400	24	2	43	25	94
31-Aug	Thu	1300-1400	5	2	7	12	26
02-Sep	Sat	1300-1400	13	10	17	26	66
03-Sep	Sun	1300-1400	22	0	26	24	72
04-Sep	Mon	1300-1400	27	2	28	26	83
07-Sep	Thu	1300-1400	4	0	9	8	21
08-Sep	Fri	1300-1400	0	0	8	9	17
09-Sep	Sat	1300-1400	0	2	33	25	60
10-Sep	Sun	1300-1400	9	2	17	17	45
11-Sep	Mon	1300-1400	4	2	23	6	35
Weekday	Mean	-	7	1	18	12	39
	%	-	19.2%	3.1%	46.6%	31.1%	-
Weekend	Mean	-	14	3	24	24	65
	%	-	21.8%	4.9%	37.1%	36.2%	-

a. Areas were: 1 - Chase to Shuswap.
2 - Shuswap to Niskanlith Creek.
3 - Niskanlith Creek to the bluffs.
4 - Bluffs to Prichard.

b. Includes Banana Island site.

Appendix 15. Daily catch (harvest and release) per angler hour in the 1989 South Thompson River sport fishery.

Date	Banana Island		Roving Survey	
	Chinook adult	Chinook jack	Chinook adult	Chinook jack
30-Aug	0.0000	0.0000	0.0293	0.0000
31-Aug	0.0923	0.0000	0.0237	0.0000
02-Sep	0.3636	0.0000	0.0449	0.0112
03-Sep	0.0000	0.0000	0.0274	0.0000
04-Sep	0.0227	0.0000	0.0339	0.0097
07-Sep	0.0000	0.0000	0.0000	0.0000
08-Sep	0.0000	0.1176	0.0000	0.0000
09-Sep	0.0000	0.0000	0.0050	0.0000
10-Sep	0.0000	0.0000	0.0165	0.0165
11-Sep	0.0000	0.0000	0.0000	0.0000
Total a				
HPUE	0.0249	0.0183	0.0210	0.0018
RPUE	0.0029	0.0183	0.0000	0.0010
Combined	0.0278	0.0366	0.0210	0.0028

a. Weighted; see Methods.

Appendix 16a. Interview responses by day at Martel in the 1989 Thompson River (Spences Bridge) sport fishery.

	08-Jul	09-Jul	15-Jul	16-Jul	22-Jul	23-Jul	29-Jul	30-Jul	Total
Number of Interviews	5	2	6	8	16	5	5	4	51
Weather a	C	C	O	-	C	C	C	C	-
Mean Angler Day Length (hr.)									
- All anglers	3.7	4.5	2.7	3.3	2.1	3.0	2.2	4.8	3.0
- Complete trip interviews									
Number	2	0	6	5	9	5	4	2	33
Hours	2.5	-	2.7	1.7	1.4	3.0	1.0	4.0	2.1
- Incomplete trip interviews									
Number	3	2	0	3	7	0	1	2	18
Hours	4.5	4.5	-	5.8	3.0	-	7.0	5.5	4.4
Mean number of anglers per party	1.8	2.0	1.0	2.3	2.3	3.4	1.5	1.5	2.0
Target Species									
- Chinook	2	2	2	7	14	4	2	2	35
- Rainbow	1	-	1	1	2	1	3	2	11
- Anything	2	-	3	-	-	-	-	-	5
Harvested Catch									
- Rainbow	-	-	1	-	-	-	-	-	1
Released Catch									
- Rainbow	-	-	3	-	-	-	-	-	3
Inspection of Catch									
- Number	0	0	1	0	0	0	0	0	1
- Number correct	-	-	1	-	-	-	-	-	1
Gear									
- Bait	-	-	-	4	1	1	2	1	9
- Lure	2	2	1	1	1	4	1	2	14
- Bait/lure	2	-	3	3	11	-	1	1	21
- Fly	1	-	2	-	3	-	1	-	7

a. C - clear; O - overcast; R - rain.

Appendix 16b. Interview responses by day at the Nicola River mouth in the 1989 Thompson River (Spences Bridge) sport fishery.

	08-Jul	09-Jul	15-Jul	16-Jul	22-Jul	23-Jul	29-Jul	30-Jul	06-Aug	13-Aug
Number of Interviews	11	13	30	49	39	32	10	33	28	19
Weather a	C	C	O	-	C	C	C	C	C	C
Mean Angler Day Length (hr.)										
- All anglers	4.5	3.3	5.6	4.5	5.4	5.2	2.4	4.2	4.0	4.3
- Complete trip interviews										
Number	7	5	18	31	31	25	7	30	26	16
Hours	2.8	1.2	4.8	4.0	5.3	4.9	1.6	4.0	4.0	4.1
- Incomplete trip interviews										
Number	4	8	12	18	8	7	3	3	2	3
Hours	7.4	4.6	6.8	5.3	5.8	6.4	4.2	5.5	4.5	5.5
Mean number of anglers per party	2.0	1.7	2.7	2.1	2.5	2.8	1.8	2.9	2.4	2.7
Target Species										
- Chinook	11	10	30	49	39	32	10	33	28	19
- Anything	-	3	-	-	-	-	-	-	-	-
Harvested Catch										
- Chinook	5	8	14	21	10	5	4	5	4	5
- Chinook, adipose clipped	2	1	1	5	1	1	1	2	4	1
- Chinook jack	-	-	1	-	-	-	-	-	-	-
Released Catch										
- Chinook	8	8	1	2	-	-	2	1	8	10
Inspection of Catch										
- Number	7	9	12	26	10	5	4	7	8	6
- Number correct	7	9	12	26	10	5	4	7	8	6
Gear										
- Bait	11	10	22	44	33	30	8	26	26	19
- Lure	-	1	3	1	4	-	1	-	1	-
- Bait/lure	-	2	5	3	2	2	1	7	1	-
- Fly	-	-	-	1	-	-	-	-	-	-

a. C - clear; O - overcast; R - rain.

Continued

Appendix 16b. Interview responses by day at the Nicola River mouth in the 1988 Thompson River (Spences Bridge) sport fishery, continued.

	20-Aug	27-Aug	Total
Number of Interviews	22	9	295
Weather a	C	C	-
Mean Angler Day Length (hr.)			
- All anglers	5.2	2.4	4.6
- Complete trip interviews			
Number	14	9	219
Hours	4.3	2.4	4.1
- Incomplete trip interviews			
Number	8	0	76
Hours	6.8	-	5.8
Mean number of anglers per party	3.2	1.7	2.5
Target Species			
- Chinook	22	9	292
- Anything	-	-	3
Harvested Catch			
- Chinook	4	-	85
- Chinook, adipose clipped	-	-	19
- Chinook jack	-	-	1
Released Catch			
- Chinook	-	-	40
Inspection of Catch			
- Number	4	0	98
- Number correct	4	-	98
Gear			
- Bait	21	5	255
- Lure	-	2	13
- Bait/lure	1	2	26
- Fly	-	-	1

a. C - clear; O - overcast; R - rain.

Appendix 17. Daily catch (harvest and release) per angler-hour in the 1989 Thompson River (Spences Bridge) sport fishery.

	Nicola River Mouth		Hartel
Date	Chinook adult	Chinook jack	Rainbow trout
08-Jul	0.5357	0.0000	0.0000
09-Jul	0.7556	0.0000	0.0000
15-Jul	0.1208	0.0075	0.2500
16-Jul	0.1873	0.0000	0.0000
22-Jul	0.0618	0.0000	0.0000
23-Jul	0.0441	0.0000	0.0000
29-Jul	0.5185	0.0000	0.0000
30-Jul	0.0645	0.0000	0.0000
06-Aug	0.1475	0.0000	0.0000
13-Aug	0.2353	0.0000	0.0000
20-Aug	0.0415	0.0000	0.0000
27-Aug	0.0000	0.0000	0.0000
Total			
HPUE	0.0964	0.0009	0.0105
RPUE	0.0371	0.0000	0.0316
Combined	0.1335	0.0009	0.0421

Appendix 18. Mean nose-fork length and weight, by flesh colour, age and sex, of chinook salmon harvested in the 1989 Thompson River (Spences Bridge) sport fishery.

			Male				Female				Total a			
Date	Flesh color	Age	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)
08-Jul	Red	5/2	1	25.0%	82.0	5.4	1	50.0%	80.0	5.4	2	33.3%	81.0	5.4
		4/2	2	50.0%	73.5	4.3	1	50.0%	73.0	4.5	3	50.0%	73.3	4.4
		3/1	1	25.0%	75.0	4.5	0	0.0%	-	-	1	16.7%	75.0	4.5
		Unknown	1	-	65.0	2.7	0	-	-	-	1	-	65.0	2.7
		Total	5	-	73.8	4.3	2	-	76.5	5.0	7	-	74.6	4.5
09-Jul	Red	4/2	2	66.7%	73.5	4.1	1	50.0%	70.0	3.6	4	66.7%	73.3	4.2
		4/1	0	0.0%	-	-	1	50.0%	84.0	7.3	1	16.7%	84.0	7.3
		3/1	1	33.3%	70.0	3.6	0	0.0%	-	-	1	16.7%	70.0	3.6
		Unknown	2	-	71.5	3.2	2	-	66.5	2.9	4	-	69.0	3.1
		Total	5	-	72.0	3.6	4	-	71.8	4.2	10	-	72.3	4.0
15-Jul	Red	5/2	1	14.3%	80.0	5.4	1	33.3%	83.0	6.4	2	20.0%	81.5	5.9
		4/2	6	85.7%	76.3	4.9	2	66.7%	68.0	2.9	8	80.0%	74.3	4.4
		Unknown	3	-	71.0	4.4	2	-	65.5	4.0	5	-	68.8	4.2
		Total	10	-	75.1	4.8	5	-	70.0	4.0	15	-	73.4	4.6
16-Jul	Red	5/2	0	0.0%	-	-	1	16.7%	83.0	6.4	1	5.9%	83.0	6.4
		4/2	11	100.0%	75.3	4.8	5	83.3%	74.0	4.3	16	94.1%	74.9	4.7
		Unknown	3	-	71.0	3.6	5	-	74.0	4.8	8	-	72.9	4.4
		Total	14	-	74.4	4.6	11	-	74.8	4.7	25	-	74.6	4.6
22-Jul	Red	5/2	0	0.0%	-	-	1	100.0%	82.0	6.4	1	33.3%	82.0	6.4
		4/2	2	100.0%	78.0	5.2	0	0.0%	-	-	2	66.7%	78.0	5.2
		Unknown	5	-	78.2	5.4	3	-	78.3	5.9	8	-	78.3	5.6
		Total	7	-	78.1	5.4	4	-	79.3	6.0	11	-	78.5	5.6
23-Jul	Red	Unknown	4	-	76.0	4.9	2	-	73.5	5.4	6	-	75.2	5.1
		Total	4	-	76.0	4.9	2	-	73.5	5.4	6	-	75.2	5.1
29-Jul	Red	4/2	1	100.0%	81.0	5.9	0	-	-	-	2	100.0%	79.0	5.0
		Unknown	1	-	77.0	5.4	1	-	73.0	3.6	3	-	73.0	4.1
		Total	2	-	79.0	5.7	1	-	73.0	3.6	5	-	75.4	4.4
30-Jul	Red	4/2	5	83.3%	71.8	4.0	4	100.0%	69.0	3.4	9	90.0%	70.6	3.7
		3/1	1	16.7%	68.0	4.1	0	0.0%	-	-	1	10.0%	68.0	4.1
		Unknown	5	-	72.8	4.1	0	-	-	-	5	-	72.8	4.1
		Total	11	-	71.9	4.1	4	-	69.0	3.4	15	-	71.1	3.9
13-Aug	Red	4/2	0	-	-	-	1	100.0%	83.0	5.4	1	100.0%	83.0	5.4
		Unknown	2	-	72.0	3.9	3	-	78.0	4.8	5	-	75.6	4.4
		Total	2	-	72.0	3.9	4	-	79.3	5.0	6	-	76.8	4.6
20-Aug	Red	4/2	1	100.0%	70.0	3.6	1	100.0%	68.0	2.7	2	100.0%	69.0	3.2
		Unknown	1	-	94.0	7.7	1	-	74.0	3.6	2	-	84.0	5.7
		Total	2	-	82.0	5.7	2	-	71.0	3.2	4	-	76.5	4.4

Appendix 18. Mean nose-fork length and weight, by flesh colour, age and sex, of chinook salmon harvested in the 1989 Thompson River (Spences Bridge) sport fishery.

			Male				Female				Total a			
Date	Flesh color	Age	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)	No.	%	Mean length (cm)	Mean weight (kg)
Total	Red	5/2	2	5.7%	81.0	5.4	4	20.0%	82.0	6.1	6	10.5%	81.7	5.9
		4/2	30	85.7%	74.9	4.6	15	75.0%	71.7	3.8	47	82.5%	73.9	4.4
		4/1	0	0.0%	-	-	1	5.0%	84.0	7.3	1	1.8%	84.0	7.3
		3/1	3	8.6%	71.0	4.1	0	0.0%	-	-	3	5.3%	71.0	4.1
		Unknown	27	-	74.4	4.5	19	-	73.5	4.6	47	-	73.9	4.5
		Total	65	-	74.6	4.6	39	-	74.0	4.5	104	-	74.4	4.6
CWT	Red	4/2	5	83.3%	74.0	4.7	6	100.0%	73.7	4.2	12	90.0%	74.1	4.4
sub-		3/1	1	16.7%	70.0	3.6	0	0.0%	-	-	1	10.0%	70.0	3.6
total b		Unknown	6	-	73.7	4.2	0	-	-	-	6	-	73.7	4.2
		Total	12	-	73.5	4.4	6	-	73.7	4.2	19	-	73.7	4.3

a. Total may differ from the sum of sexes in cases where sex was not recorded.
b. Age 3/1 was a 1986 brood Deadman River release; age 4/2 were 1985 brood Nicola River releases.

Appendix 19a. Total angler effort, chinook adult harvest and HPUE by trip duration in the June 1989 lower Fraser River sport fishery.

Angler day length to time of interview (hour)	Complete trip interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	58	7.2%	50.0	0.9%	2	1.6%	0.0400
1.1 - 2.0	53	6.5%	92.0	1.6%	6	4.7%	0.0652
2.1 - 3.0	57	7.0%	164.5	2.9%	6	4.7%	0.0365
3.1 - 4.0	74	9.1%	289.0	5.1%	3	2.3%	0.0104
4.1 - 5.0	62	7.7%	299.0	5.3%	5	3.9%	0.0167
5.1 - 6.0	55	6.8%	326.0	5.7%	11	8.6%	0.0337
6.1 - 7.0	88	10.9%	597.0	10.5%	14	10.9%	0.0235
7.1 - 8.0	74	9.1%	582.0	10.2%	17	13.3%	0.0292
8.1 - 9.0	67	8.3%	586.5	10.3%	8	6.3%	0.0136
9.1 - 10.0	63	7.8%	620.5	10.9%	18	14.1%	0.0290
10.1 - 11.0	36	4.4%	383.5	6.7%	8	6.3%	0.0209
11.1 - 12.0	21	2.6%	250.0	4.4%	5	3.9%	0.0200
12.1 - 13.0	26	3.2%	334.5	5.9%	4	3.1%	0.0120
13.1 - 14.0	27	3.3%	377.0	6.6%	6	4.7%	0.0159
14.1 - 15.0	29	3.6%	424.5	7.5%	4	3.1%	0.0094
15.1 - 16.0	20	2.5%	313.5	5.5%	11	8.6%	0.0351
16.1 - 17.0	0	0.0%	0.0	0.0%	0	0.0%	-

Appendix 19b. Total angler effort, chinook adult harvest and HPUE by trip duration in the July 1989 lower Fraser River sport fishery.

Angler day length to time of interview (hour)	Complete trip interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	36	3.5%	24.5	0.3%	4	4.8%	0.1633
1.1 - 2.0	63	6.1%	116.5	1.4%	2	2.4%	0.0172
2.1 - 3.0	65	6.3%	180.5	2.2%	5	6.0%	0.0277
3.1 - 4.0	62	6.0%	238.5	2.9%	4	4.8%	0.0168
4.1 - 5.0	86	8.3%	420.0	5.2%	3	3.6%	0.0071
5.1 - 6.0	65	6.3%	378.0	4.6%	5	6.0%	0.0132
6.1 - 7.0	77	7.4%	527.5	6.5%	11	13.1%	0.0209
7.1 - 8.0	105	10.1%	816.5	10.0%	2	2.4%	0.0024
8.1 - 9.0	92	8.9%	810.5	9.9%	8	9.5%	0.0099
9.1 - 10.0	156	15.0%	1541.0	18.9%	14	16.7%	0.0091
10.1 - 11.0	42	4.0%	458.0	5.6%	8	9.5%	0.0175
11.1 - 12.0	22	2.1%	255.5	3.1%	3	3.6%	0.0117
12.1 - 13.0	21	2.0%	268.5	3.3%	0	0.0%	0.0000
13.1 - 14.0	71	6.8%	985.5	12.1%	7	8.3%	0.0071
14.1 - 15.0	69	6.6%	1024.5	12.6%	7	8.3%	0.0068
15.1 - 16.0	7	0.7%	108.5	1.3%	1	1.2%	0.0092
16.1 - 17.0	0	0.0%	0.0	0.0%	0	0.0%	-

Appendix 19c. Total angler effort, chinook adult harvest and HPUE by trip duration in the 1989 upper Quesnel River sport fishery.

Angler day length to time of interview (hour)	Complete trip interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	74	59.2%	44.0	19.0%	2	40.0%	0.0455
1.1 - 2.0	20	16.0%	36.5	15.8%	3	60.0%	0.0822
2.1 - 3.0	11	8.8%	29.5	12.8%	0	0.0%	0.0000
3.1 - 4.0	4	3.2%	16.0	6.9%	0	0.0%	0.0000
4.1 - 5.0	7	5.6%	33.5	14.5%	0	0.0%	0.0000
5.1 - 6.0	2	1.6%	11.0	4.8%	0	0.0%	0.0000
6.1 - 7.0	1	0.8%	7.0	3.0%	0	0.0%	0.0000
7.1 - 8.0	2	1.6%	16.0	6.9%	0	0.0%	0.0000
8.1 - 9.0	3	2.4%	25.5	11.0%	0	0.0%	0.0000
9.1 - 10.0	0	0.0%	0.0	0.0%	0	0.0%	-
10.1 - 11.0	0	0.0%	0.0	0.0%	0	0.0%	-
11.1 - 12.0	1	0.8%	12.0	5.2%	0	0.0%	0.0000
12.1 - 13.0	0	0.0%	0.0	0.0%	0	0.0%	-
13.1 - 14.0	0	0.0%	0.0	0.0%	0	0.0%	-
14.1 - 15.0	0	0.0%	0.0	0.0%	0	0.0%	-
15.1 - 16.0	0	0.0%	0.0	0.0%	0	0.0%	-
16.1 - 17.0	0	0.0%	0.0	0.0%	0	0.0%	-

Appendix 19d. Total angler effort, chinook adult harvest and HPUE by trip duration in the 1989 lower Shuswap River sport fishery.

Angler day length to time of interview (hour)	Complete trip interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	290	25.5%	234.0	7.2%	3	9.4%	0.0128
1.1 - 2.0	288	25.4%	519.0	15.9%	5	15.6%	0.0096
2.1 - 3.0	198	17.4%	555.0	17.0%	6	18.8%	0.0108
3.1 - 4.0	138	12.1%	524.0	16.0%	9	28.1%	0.0172
4.1 - 5.0	86	7.6%	416.5	12.7%	1	3.1%	0.0024
5.1 - 6.0	53	4.7%	308.0	9.4%	3	9.4%	0.0097
6.1 - 7.0	28	2.5%	191.0	5.8%	5	15.6%	0.0262
7.1 - 8.0	25	2.2%	196.0	6.0%	0	0.0%	0.0000
8.1 - 9.0	10	0.9%	88.5	2.7%	0	0.0%	0.0000
9.1 - 10.0	6	0.5%	59.0	1.8%	0	0.0%	0.0000
10.1 - 11.0	6	0.5%	64.5	2.0%	0	0.0%	0.0000
11.1 - 12.0	1	0.1%	12.0	0.4%	0	0.0%	0.0000
12.1 - 13.0	1	0.1%	13.0	0.4%	0	0.0%	0.0000
13.1 - 14.0	3	0.3%	42.0	1.3%	0	0.0%	0.0000
14.1 - 15.0	0	0.0%	0.0	0.0%	0	0.0%	-
15.1 - 16.0	1	0.1%	16.0	0.5%	0	0.0%	0.0000
16.1 - 17.0	2	0.2%	33.0	1.0%	0	0.0%	0.0000

Appendix 19e. Total angler effort, chinook adult harvest and HPUE by trip duration in the 1989 South Thompson River sport fishery.

Angler day length to time of interview (hour)	Complete trip interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	157	27.0%	120.5	6.9%	3	7.7%	0.0249
1.1 - 2.0	135	23.2%	242.5	13.8%	3	7.7%	0.0124
2.1 - 3.0	93	16.0%	265.5	15.1%	11	28.2%	0.0414
3.1 - 4.0	59	10.2%	222.0	12.6%	3	7.7%	0.0135
4.1 - 5.0	38	6.5%	183.5	10.4%	6	15.4%	0.0327
5.1 - 6.0	39	6.7%	225.5	12.8%	3	7.7%	0.0133
6.1 - 7.0	23	4.0%	159.5	9.1%	3	7.7%	0.0188
7.1 - 8.0	15	2.6%	116.5	6.6%	2	5.1%	0.0172
8.1 - 9.0	11	1.9%	99.0	5.6%	3	7.7%	0.0303
9.1 - 10.0	4	0.7%	38.0	2.2%	2	5.1%	0.0526
10.1 - 11.0	2	0.3%	22.0	1.3%	0	0.0%	0.0000
11.1 - 12.0	3	0.5%	35.5	2.0%	0	0.0%	0.0000
12.1 - 13 0	0	0.0%	0.0	0.0%	0	0.0%	-
13.1 - 14.0	2	0.3%	28.0	1.6%	0	0.0%	0.0000
14.1 - 15.0	0	0.0%	0.0	0.0%	0	0.0%	-
15.1 - 16.0	0	0.0%	0.0	0.0%	0	0.0%	-
16.1 - 17.0	0	0.0%	0.0	0.0%	0	0.0%	-

Appendix 19f. Total angler effort, chinook adult harvest and HPUE by trip duration in the 1989 Thompson River (Spences Bridge) sport fishery. a

Angler day length to time of interview (hour)	Complete trip interviews		Angler effort		Chinook adult harvest		Chinook adult HPUE
	No.	%	Hours	%	No.	%	
0 - 1.0	49	16.6%	36.5	3.4%	36	34.6%	0.9863
1.1 - 2.0	48	16.3%	87.5	8.1%	18	17.3%	0.2057
2.1 - 3.0	43	14.6%	121.0	11.2%	12	11.5%	0.0992
3.1 - 4.0	36	12.2%	137.0	12.7%	14	13.5%	0.1022
4.1 - 5.0	51	17.3%	237.5	22.0%	10	9.6%	0.0421
5.1 - 6.0	31	10.5%	180.5	16.7%	8	7.7%	0.0443
6.1 - 7.0	19	6.4%	130.5	12.1%	2	1.9%	0.0153
7.1 - 8.0	13	4.4%	102.5	9.5%	2	1.9%	0.0195
8.1 - 9.0	4	1.4%	35.0	3.2%	2	1.9%	0.0571
9.1 - 10.0	0	0.0%	0.0	0.0%	0	0.0%	-
10.1 - 11.0	1	0.3%	10.5	1.0%	0	0.0%	0.0000
11.1 - 12.0	0	0.0%	0.0	0.0%	0	0.0%	-
12.1 - 13.0	0	0.0%	0.0	0.0%	0	0.0%	-
13.1 - 14.0	0	0.0%	0.0	0.0%	0	0.0%	-
14.1 - 15.0	0	0.0%	0.0	0.0%	0	0.0%	-
15.1 - 16.0	0	0.0%	0.0	0.0%	0	0.0%	-
16.1 - 17.0	0	0.0%	0.0	0.0%	0	0.0%	-

a. Nicola River Mouth only.

Appendix 20. Variance estimation procedure for acess point surveys (adapted from DPA Group Inc. (MS 1985a)).

CATCH (C)

(1) $$Var(C) = \bar{c}^2 E^2 \left[\frac{Var(E)}{E^2} + \frac{Var(\bar{c})}{\bar{c}^2} + \frac{Var(E)\,Var(\bar{c})}{\bar{c}^2 E^2} \right]$$

where: E = estimate study period effort (hours);
$Var(E)$ = variance of the estimated study period effort (Equation 2)
$\bar{c}$ = estimated study period catch per angler hour;
$Var(\bar{c})$ = variance of the estimated study period catch per angler hour (Equation 3).

EFFORT (E)

(2) $$Var(E) = N^2 \left[\frac{\bar{y}_j^*}{\bar{p}_j^*} \right]^2 \left[\frac{Var(\bar{y}_j^*)}{\bar{y}_j^{*2}} + \frac{Var(\bar{p}_j^*)}{\bar{p}_j^{*2}} - \frac{2Cov(\bar{y}_j^*, \bar{p}_j^*)}{(\bar{y}_j^*)(\bar{p}_j^*)} \right]$$

where: N = total days in the study period;
$\bar{y}_j^*$ = mean instantanous rod count (hour j*);
$Var\ \bar{y}_j^*$ = variance of the mean rod count at hour j* (Equation 4);
$\bar{p}_j^*$ = proportion of daily angler hours occurring at the time of the instantaneous rod count;
$Var\ \bar{p}_j^*$ = variance of the proportion of daily angler hours occurring at the time of the instantaneous rod count (Equation 5).

CATCH PER UNIT EFFORT ($\bar{c}$)

Beacause $\bar{c}$ is a ratio of catch to time of interview ($\hat{x}$) and time fished to time of interview ($\hat{t}$), a Taylor series approximation to the variance of the ratio of random variables was used. Because we expected to interview a relatively large proportion of the anglers, especially at the access point sites, the greatest variance was expected to occur at the stint level; consequently, the following estimate embodies only that sampling stage.

(3) $$Var(\bar{c}) = \left[\frac{\hat{x}}{\hat{t}} \right]^2 \left[\frac{Var(\hat{x})}{\hat{x}^2} + \frac{Var(\hat{t})}{\hat{t}^2} - \frac{2Cov(\hat{x}, \hat{t})}{(\hat{x})(\hat{t})} \right]$$

where: $$Cov(\hat{x}, \hat{t}) = \sum_i \sum_l N^2 (1/n_{ij} - 1/N) \sum_f \left[\frac{(\hat{x}_{ilf}\,\hat{t}_{ilf}) - 1/n_{ij} \sum_f \hat{x}_{ilf} \sum_i \hat{t}_{ilf}}{n_{ij} - 1} \right]$$

$$Var(\hat{x}) = \sum_i \sum_l N^2 (1/n_{ij} - 1/N) \sum_f \left[\frac{(\hat{x}_{ilf} - (1/n_{if} \sum_f \hat{x}_{ilf}))^2}{n_{ij} - 1} \right]$$

$Var(\hat{t})$ is analogous to above.

$\hat{x}_{ilf}$ = estimated total catch for the fth stint of the 1th stint type at the ith site;

$\hat{t}_{ilf}$ = estimated total angler hours for the f^{th} stint of the l^{th} stint type at the i^{th} site;

n_{ij} = number of interview sample days at site i on hour j.

MEAN INSTANTANEOUS ROD COUNT ($\bar{y}_j^*$)

$$(4) \qquad Var(\bar{y}_j^*) = (1/n_j^* - 1/N) \sum_k \left[\frac{(y_j^* k - \bar{y}^*)^2}{n_j^* - 1} \right]$$

where:

$\bar{n}_j^*$ = number of instantaneous rod counts at hour j*;

$y_j^*{}_k$ = instantaneous rod count (all sites) on day k;

$\bar{y}_j^*{}_k$ = estimated mean rod count at hour j*.

PROPORTION OF DAILY EFFORT AT TIME OF INSTANTANEOUS ROD COUNT ($\bar{p}_j^*$).

Because $\bar{p}_j^*$ is a ratio of $\hat{R}_j$ and ΣR_j the following Taylor Series approximation to the variance of the ratio of random variables was used:

$$(5) \qquad Var(\bar{P}_j^*) = \left[\frac{\hat{R}_j^*}{\sum_j \hat{R}_j} \right]^2 \left[\frac{Var(\hat{R}_j^*)}{\hat{R}_j^{*2}} + \frac{Var \sum_j \hat{R}_j}{\sum_j \hat{R}_j^2} - \frac{2Cov(\hat{R}_j^*, \sum_j \hat{R}_j)}{(\hat{R}_j^*)(\sum_j \hat{R}_j)} \right]$$

where:

$$Cov(\hat{R}_j^*, \sum_j \hat{R}_j) = \sum_l N^2 (1/n_{ij}^* - 1/N) \sum_k \left[\frac{(r_{ij}^* k \sum_j r_{ijk}) - (1/n_{ij}^* \sum_k r_{ij}^* k \sum_i \sum_j r_{ijk})}{n_{ij}^* - 1} \right]$$

$$Var(\hat{R}_j^*) = \sum_l N^2 (1/n_{ij}^* - 1/N) \sum_k \left[\frac{(r_{ij}^* k - (1/n_{ij}^* \sum_k r_j^* k))^2}{n_{ij}^* - 1} \right]$$

Var $\sum_j \hat{R}_j$ is analagous to above.

N = number of days in stratum;

n_{ij}^* = number of interview sample days at site i;

r_{ijk} = rod count at site i at hour j on day k;

$r_{ij}^* k$ = rod count at site i on day k at the hour of the instantaneous effort count;

$\hat{R}_j^*$ = estimated total effort (hours) during the instantaneous rod count time block;

$\sum_j \hat{R}_j$ = estimated total effort over all hours and days at the sites surveyed.